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THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

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ERRATA, VOLUME XII

Page 51, 4th line from top, read *officinale* for *officinalis.*
Page 228, 3d line from bottom, read *breeding* for *breedong.*
Page 256, 3d line from top, read *Blakeslee* for *Blakslee.*
Page 266, 9th line from bottom, read *Aconitum* for *Aconitium.*
Page 268, 7th line from top, capitalize *Hydrastis* and *Berberis.*
Page 276, 4th line from top, read *G. H. Shull* for *G. A. Shull.*
Page 276, 7th line from bottom, read *Roland Thaxter* for *R. B. Thaxter.*

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JOHN TORREY, 1796–1873

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THE TORREY BOTANICAL CLUB

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TORREYA

January, 1912

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LIST OF PLANTS COLLECTED ON THE PEARY ARCTIC EXPEDITION OF 1905–06 AND 1908–09 WITH A GENERAL DESCRIPTION OF THE FLORA OF NORTHERN GREENLAND AND ELLESMERE LAND

By P. A. Rydberg

(Continued from December Torreya)

II. List of Plants Collected by Dr. L. J. Wolf and by Dr. J. W. Goodsell

Ferns*

Dryopteris dilatata (Hoffm.) A. Gray (*Aspidium spinulosum dilatatum* Hook.). A rather common species of north temperate regions of America, Europe, and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 78*, *86*, and *88*.

Filix fragilis (L.) Underwood (*Cystopteris fragilis* Bernh.). A species distributed over most parts of the world in colder or mountainous regions.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 43*.

Monocotyledons

Alopecurus alpinus Smith. A grass of arctic swamps and meadows of North America, Europe, and Asia, also found in the northern Rocky Mountains and the mountains of Scotland.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 23;* vicinity of Cape Sheridan, Grant Land, June 15–17, 1909, *Goodsell 56*.

Calamagrostis canadensis L. A common grass of open woods,

* Determined by Mr. R. C. Benedict.

[No. 12, Vol. 11, of Torreya, comprising pp. 249–278, was issued 12 Ja 1912. The date, 20 D 1911, given in December Torreya, as the day of issue, is an error.]

thickets, and meadows from Labrador to North Carolina, California, and Alaska.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 64* and *66*.

Deschampsia flexuosa (L.) Trin. In dry places from southern Greenland to North Carolina, Tennessee, and Michigan; also in Europe and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 65* and *62* (the latter bears leaves only, but probably belongs here).

Poa alpina L. An alpine-arctic grass, distributed over arctic and subarctic North America and extending south to Quebec and Lake Superior and in the Rocky Mountains to Colorado; also in Europe and Asia.

Grant Land, July, 1906, *Wolf*. Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 9*.

Poa glauca Vahl. (*P. caesia* Smith). An arctic grass of circumpolar distribution; found also in the White Mountains of New Hampshire and some of the mountains of northern Europe and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 63* and *87*.

Poa glauca elatior And. With the species but less common and apparently restricted to arctic North America.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 24*.

Poa abbreviata R. Br. A very rare, truly arctic species, distributed from the arctic coast of North America to Greenland and Spitzbergen.

Grant Land, July, 1906, *Wolf;* vicinity of Cape Sheridan, Grant Land, June 15–July 17, 1909, *Goodsell 57;* also a sterile tuft (not numbered) which probably belongs here.

Poa evagans Simmons. The specimens in the collection are doubtfully referred to this species, of which there are no specimens in the herbaria here in America. The only locality given by Simmons is on the southern coast of Ellesmere Land.

Grant Land, July, 1906, *Wolf*.

Festuca rubra L. Meadows from Greenland to North Carolina, California, and Alaska; also in Europe and Asia.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 40*.

Festuca supina Schkur (*F. ovina supina* Hackel). A fairly common dry-land species of arctic-alpine North America, Europe, and Asia, in this country extending south to Vermont, Colorado, and California.

Vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 55*.

Festuca supina forma *vivipara*. The specimens in this collection have the glumes hirsutulous, at variance with the usual form of *F. supina*. They match perfectly specimens collected by Lundbom at Nunarsuak, Greenland.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 67* and *76*.

Eriophorum Scheuchzeri Hoppe. In swamps from Greenland to Newfoundland, Manitoba, Oregon, and Alaska; also in Europe.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 3;* ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 75*.

Carex canescens L.* Swamp from Newfoundland and Labrador to Virginia, Colorado, Oregon, and Alaska; also in Europe and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, *Goodsell 69*.

Carex brunnescens gracilior Britton.* Moist places from Labrador to New York, Colorado, and British America.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 68*.

Juncoides hyperboreum (R. Br.) Sheld. (*Luzula confusa* Lindebl.). A species of arctic America, Europe, and Asia; extending south in this country to the mountains of New England and the northern Rockies.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 22*.

Dicotyledons

Salix Waghornei Rydb. A rare willow, found in Newfoundland and Labrador.

* Determined by Mr. K. K. Mackenzie.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 73*. (Leaves only, but evidently belonging here.)

Salix glauca L. A species common in arctic and subarctic Europe. The specimens belong to the American form growing in Labrador and Newfoundland. It differs considerably from the European form, especially in pubecsence, and may be distinct.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 72*.

Salix arctica Pall. A dwarf arctic species of willow, common in Asia and western North Amĕrica but rare in the northeastern part of the latter continent. Only a small sterile specimen was collected by Dr. Wolf, which seems to belong to this species.

Grant Land, July, 1906, *Wolf*.

Salix groenlandica (Anders.) Lundstr. A dwarf arctic willow confined to Greenland, Labrador, and the islands of Baffin Bay.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 5;* Grant Land, Latitude 82° 27′, July, 1906, *Wolf*.

Salix anglorum Cham. (*S. arctica* R. Br.; not Pall.; *S. arctica Brownei* Anders.). A dwarf arctic species, ranging from Greenland to Alaska.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 6* (depauperate); vicinity of Cape Saumarey, August, 1908, *Goodsell 26*.

Oxyria digyna (L.) Hill. The arctic sorrel is common in arctic and alpine regions of North America, Europe, and Asia, extending south in this country to New Hampshire, Colorado, and California.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 19;* vicinity of Cape Sheridan, Grant Land, July 15 to Aug. 17, 1909, *Goodsell;* Grant Land, July, 1906, *Wolf*.

Bistorta vivipara (L.) S. F. Gray (*Polygonum viviparum* L.). In cold swamps from Greenland to New Hampshire, Colorado, and Alaska; also in Europe and Asia.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 20*.

Alsine Edwardsii (R. Br.) Rydb. (*Stellaria Edwardsii* R. Br.). An arctic species ranging from Greenland and Labrador to the Hudson Bay region, the Canadian Rockies, and Alaska.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 15;* vicinity of Etah, Aug. 8–16, 1908, *Goodsell 37;* Grant Land, July, 1906, *Wolf.* In *Goodsell 15*, the calyx is more or less white-villous.

Cerastium alpinum L. An arctic-alpine species, the range of which extends from Greenland to Quebec, the Canadian Rockies, and Alaska; also in Europe and Asia.

Grant Land, July, 1906, *Wolf;* vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 8;* vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 13;* ravine on Caribou Island, Battle Harbor, Aug. 15, 1909, *Goodsell 79;* vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 54.* (The latter is a depauperate form answering to var. 3 of Simmon's Vascular Plants of Ellesmereland.)

Cerastium alpinum lanatum Lindebl. An arctic variety, confined to Greenland and neighboring islands.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 14.*

Wahlbergella apetala (L.) Fries (*Lychnis apetala* L.). An arctic-alpine species, distributed through the colder parts of Europe, Asia, and North America, in the latter extending south to Labrador and in the Rockies to Utah and Colorado.

Grant Land, July, 1906, *Wolf.*

Wahlbergella triflora (R. Br.) Fries (*Lynchnis triflora* R. Br.). An arctic species, apparently confined to Greenland.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 10;* vicinity of Etah, Aug. 6–18, 1908, *Goodsell 41* (poor and doubtful specimen).

Ranunculus nivalis L. An arctic-alpine species, distributed over parts of Europe, Asia, and North America, in the latter extending from Greenland and Labrador to the northern Rockies and Alaska.

Vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 51.*

Papaver radicatum Rottb. (*P. nudicaule* Lange, not L.; *P. alpinum* Am. auth.; not L.). The so-called "Iceland poppy" is one of the most showy arctic species and in many places is the characteristic plant of the arctic flora. It is common in the whole arctic region of North America and Europe, less so in Asia, where *P. nudicaule* L., a related species, is more common.

P. radicatum extends south to Labrador and in the Rockies to Colorado.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 1;* vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 12;* vicinity of Etah, Aug. 6–18, 1908, *Goodsell 36;* vicinity of Cape Sheridan, Grant Land, June 15–17, 1909, *Goodsell 50;* Grant Land, July, 1906, *Wolf.*

Draba alpina L. A circumpolar arctic species, in America extending south to Labrador and the Canadian Rockies.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 2;* vicinity of Cape Sheridan, Grant Land, June 15–17, 1909, *Goodsell 53* (depauperate).

Draba glacialis Adams. An arctic-alpine species distributed over most of the northern part of Asia and North America, in the latter extending south in the Rockies to Wyoming.

Vicinity of Cape Sheridan, June 15–July 17, 1909, *Goodsell 52.*

A specimen with rather densely pubescent pods is doubtfully referred here. The typical *D. glacialis* has the pod glabrous or nearly so.

Grant Land, July, 1906, *Wolf.*

Draba fladnizensis Wulfen. An arctic-alpine plant, distributed through the arctic and subarctic regions and the higher mountains of Europe, Asia, and North America, extending as far south as the Pyrenees, Himalayas and the Rockies of Colorado.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 18;* vicinity of Etah, Aug. 6–18, 1908, *Goodsell 46.*

Draba hirta L. A circumpolar arctic species, also found in the mountains of Europe and Asia, but in America confined to the arctic regions.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 25.*

Braya glabella Richardson. A rare species confined to arctic America.

Grant Land, July, 1906, *Wolf.*

Cochlearia groenlandica L. A strictly arctic species, probably of circumpolar distribution.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 27.*

Cochlearia fenestrata R. Br. An arctic species, closely related to the last and often confused with it. It is apparently confined to arctic America.

Grant Land, July, 1906, *Wolf*.

Rhodiola rosea L. (*Sedum Rhodiola* DC.). A species not uncommon in the arctic and mountainous parts of Europe; in America confined to the north, extending south to Newfoundland and Maine in the east. It has also been collected at two stations in Pennsylvania.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 74*.

Saxifraga cernua L. A circumpolar arctic-alpine species, in America extending south to Labrador and in the Rocky Mountains to Colorado.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 16;* vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 60* (depauperate specimen); Grant Land, July, 1906, *Wolf*.

Saxifraga rivularis L. A circumboreal species, in America extending south to the White Mountains and to the Rocky Mountains in Montana.

Vicinity of Etah, Aug. 6–18, .1908, *Goodsell 48*.

Muscaria caespitosa (L.) Haw. (*Saxifraga caespitosa* L.). A circumpolar arctic and subarctic species, extending in America from Greenland to Labrador, Montana, British Columbia, and Alaska.

Vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 59*.

Leptacea tricuspidata (Rottb.) Haw. (*Saxifraga tricuspidata* Rottb.). An arctic-alpine species, ranging from Greenland to Labrador, Lake Superior, the Canadian Rockies, and Alaska.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 47* and *42;* vicinity of Cape Saumarey, Aug. 8, 1909, *Goodsell 28*.

Leptacea flagellaris (Willd.) Small (*Saxifraga flagellaris* Willd.). A circumboreal alpine-arctic species, extending in America south in the Rockies to Arizona.

Vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 58;* Grant Land, July, 1906, *Wolf*.

Antiphylla oppositifolia (L.) Fourr. (*Saxifraga oppositifolia* L.). A circumpolar arctic-alpine species, in America extending south to Vermont, Montana and British Columbia.

Vicinity of Cape Sheridan, Grant Land, June 15 to July 17, 1909, *Goodsell 49;* vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 11;* Grant Land, July, 1906, *Wolf.*

Potentilla emarginata Pursh. An arctic species, ranging from Greenland and Labrador to the Canadian Rockies and Alaska; also in Siberia and on Spitzbergen.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 7;* vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 32.*

Potentilla Sommerfeltii Lehm. A rare arctic species, growing in Spitzbergen, Greenland, the Baffin Bay islands, and the arctic coast of America.

Grant Land, July, 1906, *Wolf.*

Potentilla pulchella R. Br. An arctic species of the same range as the preceding, but it has also been collected on Wrangel Island off Siberia.

Vicinity of Etah, Aug. 6–18, 1908; *Goodsell 39.*

Potentilla Vahliana Lehm. An arctic species, ranging from Greenland through the islands north of Hudson Bay, and the arctic coast of America to Alaska.

Vicinity of Cape Saumarey, Aug. 8, 1909, *Goodsell 31.*

Sibbaldiopsis tridentata (Soland.) Rydb. (*Potentilla tridentata* Soland.). A plant of rocky places, ranging from Greenland to the mountains of Georgia, west to Minnesota and Manitoba.

Ravine on Caribou Island, Battle Harbor, Aug. 15, 1909, *Goodsell 82.*

Comarum palustre L. A swamp plant distributed through northern and subalpine Europe, Asia, and America, ranging in the latter from Greenland to New England, Minnesota, Wyoming, California, and Alaska.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 77.*

Rubus Chamaemorus L. An arctic and subarctic bog plant, ranging from Labrador and Newfoundland to New Hampshire, British Columbia, and Alaska; also in Europe and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 91*. (The specimens are in leaf only.)

Dryas integrifolia Vahl. An arctic and subarctic species, distributed from Greenland to Anticosti and Alaska.

Vicinity of North Star Bay, Aug. 3–6, 1908, *Goodsell 4*. Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 21*.

Empetrum nigrum L. An arctic and subarctic undershrub of wet and rocky places from Greenland to Maine, northern New York, Michigan, Montana, and Alaska; also in Europe and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 70*.

Viola palustris L. In swamps from Labrador to New England, Colorado, Washington, and Alaska; also in Europe and Asia.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 83*.

Chamaenerion latifolium (L.) Sweet (*Epilobium latifolium* L.). An arctic-alpine plant of moist places, ranging from Greenland to Quebec, Colorado, Oregon, and Alaska; also in Europe and Asia.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 33*.

Epilobium palustre L. A circumpolar bog plant, extending in this country south to the White Mountains and Ontario.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 84*.

Cornella suecica (L.) Rydb. (*Cornus suecica* L.). A circumpolar arctic or subarctic plant of wet woods, ranging in this country from Labrador and Newfoundland to Quebec and Alaska.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 85*.

Conioselinum pumilum Rose sp. nov.

Stems simple or nearly so, low, 12 to 15 cm. high, glabrous, purplish, somewhat fluted; stem leaves 2 or 3, small, 3 to 6 cm. long, ternately divided, ultimate segment sharply toothed or cleft, glabrous; inflorescence a small compact terminal umbel, sometimes with an additional lateral one; involucre none; involucel bractlets several, filiform, longer than the pedicels; rays 12 to 18 mm. long, only slightly if at all scabrous; pedicels 3 to

4 mm. long, glabrous; fruit smooth; carpels 3 to 3.5 mm. long, a little longer than broad; stylopodium depressed.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 81*.

Pyrola grandiflora Radius (*P. rotundifolia grandiflora* DC.). An arctic and subarctic bog plant, ranging from Greenland to Labrador and the Mackenzie River.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 45*.

Cassiope tetragona (L.) D. Don. An arctic species, distributed from Greenland and Labrador to Washington and Alaska; also in Asia.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 30*.

Ledum groenlandicum Oeder (*L. latifolium* Ait.). A bog plant, ranging from Greenland to Massachusetts, New Jersey, Wisconsin, British Columbia, and Alaska.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 71*.

Vaccinium Vitis-idaea L. A circumpolar undershrub, common in Europe but rare in America, there ranging from Greenland to Massachusetts, Lake Superior, British Columbia, and Alaska.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 90*.

Campanula uniflora L. An arctic-alpine species, ranging from Greenland and Labrador to Alaska and in the Rockies south to Colorado; also in northern Europe and Asia.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 17*.

Solidago macrophylla Pursh (*Solidago thyrsoidea* E. Meyer). A plant of rocky woods from Labrador to the Catskill Mountains, Lake Superior, and Hudson Bay.

Ravine on Caribou Island, Battle Harbor, Labrador, Aug. 15, 1909, *Goodsell 80*.

Erigeron trifidus Hook. An arctic-alpine species, distributed from Greenland to Colorado, California, and Alaska.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 38*.

Arnica alpina (L.) Olin. An arctic and subarctic species, ranging from Greenland to Labrador, the Canadian Rockies, and Alaska.

Vicinity of Etah, Aug. 6–18, 1908, *Goodsell 34* and *44*.

Taraxacum phymatocarpum Vahl. An arctic species, confined to Greenland and Ellesmere Land.

Vicinity of Cape Saumarey, Aug. 8, 1908, *Goodsell 29;* vicinity of Etah, Aug. 6–18, 1908, *Goodsell 35*.

Taraxacum pumilum Dahlst. An arctic species, confined to the arctic American archipelago.

Grant Land, July, 1906, *L. J. Wolf*.

Taraxacum hyparcticum Dahlst. An arctic species, ranging from northwestern Greenland through the arctic archipelago, along the arctic coast to Point Barrow, Alaska.

Grant Land, July, 1906, *L. J. Wolf*.

NEW YORK BOTANICAL GARDEN

TWO SPECIES OF HABENARIA FROM CUBA

BY OAKES AMES

Habenaria Brittonae *sp. nov.* In general habit similar to *H. alata* Hook. 6 dm. tall, slender. *Leaves* linear-oblong to linear-lanceolate passing gradually into the foliose acute bracts of the stem. *Raceme* 12 cm. long, slender, rather densely flowered, the bracts nearly equalling or exceeding the flowers. *Lateral sepals* 6.5 mm. long, lanceolate, acute, with the midnerve produced under the point into a setiform tip, margin obscurely denticulate. *Upper sepal* broadly ovate, 5 mm. long, otherwise similar to the lateral. *Petals* subsimple or obscurely bipartite. Posterior division linear-oblong, rounded at the tip, obtuse, 5 mm. long, about 1 mm. wide, recurved-falcate, anterior division in the form of an obtuse, basal protuberance or tooth. *Labellum* tripartite, lateral divisions shorter than the middle one, setaceous, about 3 mm. long, middle division linear, 6 mm. long, obtuse, convex, the margins strongly deflexed. *Stigmatic processes* longer than the anther canals, flattened suborbicular. *Spur* longer than the labellum, about equalling the ovary or shorter, clavate, subacute, about 1 cm. long.

Folia lineari oblonga, alterna, (?) 4–5. *Bracteae* caulis vaginantes super folia lineari-lanceolatae, acutae, infra folia obtusae. *Bracteae inflorescentiae* lanceolatae, acutae, ovaria longitudine excedentes. *Sepala lateralia* lanceolata, ad apicem cuspide munita. *Sepalum superius* ovatum, obtusum. *Petala* subsimplicia, falcata, linearia, obtusa, basi antice unidentata vel petalorum partitio antica in dentum minutum reducta. *Labellum* tripartitum, laciniae laterales lineares vel filiformes 3 mm. longae, lacinia media 6 mm. longa. *Calcar* ovario brevius 1 cm. longum.

CUBA: PROVINCE OF PINAR DEL RIO, vicinity of Venales, on hillside, *N. L. & E. G. Britton*, no. 7540, September 17, 1910; Wright 3307 in Hb. Gray.

I have been unable to refer this plant satisfactorily to any described species of *Habenaria*. It is similar in habit to *H. repens* Nutt., but from that it differs markedly in the form of the petals and labellum. The cuspidate or mucronate sepals are similar to *H. repens*. It may be the form of *H. tricuspis* Rich. to which Grisebach referred in his *Catalogus Plantarum Cubensium* characterized by reduced anterior divisions of the petals, an assumption which leads to the belief that *H. tricuspis* may not be referable to the synonymy of *H. repens* after all, and that it is a variable plant, characterized by variations in the relative lengths of the lip divisions and by petals with variously reduced anterior segments. However this may be, I find in my herbarium a specimen of *H. repens* from Georgia accompanied by the following note: "Compared with Wright 3305 (sub nom. *tricuspis*) and Wright 3309 (sub nom. *tricuspis* Rich. near *H. radicans* Griseb.) at British Museum and found to be like them." The specimen in question is quite distinct from *H. Brittonae*. In the study of the type material of *H. tricuspis* Rich. the conclusions arrived at, as indicated in *Orchidaceae IV*, were that it was conspecific with *H. repens*, a conclusion which is borne out by Kränzlin in *Orchidacearum Genera et Species*, and by Cogniaux in Urban's *Symbolae Antillanae*, although neither author states that he has seen Richard's type.

Wright's 3305 and 3309 preserved in the Gray Herbarium of Harvard University, both labelled *H. tricuspis* var., are referable to *H. repens*, as they have the characteristic perianth divisions of that species. Wright's 3307, on the other hand, preserved in the same collection, is characterized by lips and petals similar to those of the plants from Venales. *H. tricuspis* as described by

Richard does not include *H. Brittonae*, which appears to be an undescribed species.

Habenaria nivea (Nutt.) Spreng.

This species, which heretofore has been known only as a native of the United States, with a range extending from Florida and Louisiana on the south to Delaware on the north, is now known to be a native of Cuba. I have examined five plants collected in Pinar del Rio Province, submitted for identification by the Director of the New York Botanical Garden. I have compared the flowers very carefully with those of *H. nivea* from Florida and other parts of the United States without being able to find distinguishing characters which indicate specific differences. There are differences, but they are slight and too trivial in my estimation to warrant the recognition of a new species.

CUBA: PINAR DEL RIO PROVINCE, Laguna Santa Maria, *N. L. & E. G. Britton, & C. S. Gager*, no. 7126, September 8, 1910. Wet sandy pine-lands, Sierra del Cabra, on Guane Road, *N. L. & E. G. Britton, & C. S. Gager*, no. 7272, September 9, 1910, on hillside.

AMES BOTANICAL LABORATORY,
NORTH EASTON, MASS.

UNDESCRIBED SPECIES OF CUBAN CACTI

BY N. L. BRITTON AND J. N. ROSE

Pereskia cubensis sp. nov.

A tree up to 4 meters high, with a trunk up to 2.5 dm. in diameter, and a large, much-branched-top; bark brownish, rather smooth, marked by black horizontal bands (representing the old areoles) broader than high. Young branches slender, smooth, with light brown bark; spines of young areoles 2 or 3, needle-like, 2–3 cm. long, of old areoles very numerous (25 or more) and much longer (5 cm. or more long); leaves bright green on both sides, somewhat fleshy, the midvein broad, distinct, the lateral veins very obscure, oblanceolate to oblong-elliptic, several at each areole, 1.5–4 cm. long, 10–12 mm. wide, acute at both ends; flowers small, white (?), solitary; peduncle very short (2–3 mm. long), fleshy, jointed near the base, bearing 1 to 3 leaf-like bracts; fruit not seen.

Dry thickets at 5–10 meters elevation, province of Oriente.

Specimens examined: *C. Wright 205* (*type*); Los Caños, March, 1909 (*N. L. Britton 2013*); near Caimanera (*Eggers 5441*).

ILLUSTRATION: Jour. N. Y. Bot. Gard. **10**: 109. *f. 22.* 1909.

Wright's plant was distributed as *P. portulacifolia* and so recorded by Grisebach, but that species of Hispaniola has quite different leaves, as is shown by the old illustration of *Cactus portulacifolius* L. is based (Plumier, ed. Burmann, *pl. 197. f. 1*) and by specimens collected by Buch in Haiti, examined by Professor Urban.

A similar, perhaps identical, species grows on La Vigia Hill, Trinidad, Province of Santa Clara (*Britton & Wilson 5513*).

Opuntia cubensis sp. nov.

Plants about 6 dm. high, rather widely branched. Joints oblong, dull green, 8–18 cm. long, 7 cm. wide or less, 1–2 cm. thick, not readily detached, their margins slightly crenate; areoles 1–2 cm. apart; spines 2–5 at each areole, acicular, pale yellow when young, becoming grayish-white, the longer 5 cm. long or less; glochides numerous, brown, 3–4 mm. long; ovary clavate, 4 cm. long, bearing several tufts of glochides; corolla pale yellow, 8 cm. broad.

In sand, valley near coast, U. S. Naval Station, Guantanamo Bay, March, 1909, *N. L. Britton 2064*.

A species of the Series Tunae, related to *O. Dillenii* and *O. lucayana*, both of which have brighter yellow spines and strongly crenate joints.

3. **Cephalocereus Brooksianus** sp. nov.

Plant 3–6 meters high, stout, much branched at base, dark bluish-green, densely pruinose. Ribs 8 to 9 deep, obtuse; areoles closely set, in flowering specimens almost contiguous, and bearing long hairs, very dense in flowering specimens; spines about 16, yellow, all somewhat similar, the upper one of each areole ascending; flowers about 5 cm. long, purplish; ovary naked.

Near Novaliches, about six miles south of Guantanamo, May 8, 1907 (*Wm. R. Maxon 4512*).

Named in honor of Mr. Theodore Brooks, of Guantanamo, who has greatly facilitated the botanical exploration of eastern Cuba.

Leptocereus Leoni sp. nov.

Plant up to 5 m. high, repeatedly branching, the round trunk 3 dm. in diameter at the base, the cortex scaly-roughened, the old areoles 1–1.5 cm. apart in vertical rows and bearing acicular spines. Ultimate branches about 1.5 cm. thick, slender, elongated, 6–8-ribbed, the ribs crenate, the areoles borne at the depressions, 1–1.5 cm. apart; spines 6–12 at each areole, yellowish when young, gray when old, slenderly acicular, 2–9 cm. long; wool brown, very short; perianth pink, withering-persistent, narrowly campanulate, 3.5 cm. long; the limb about one fourth as long as the tube, which bears numerous scattered areoles, each with 1–4 short spines or some of them spineless; segments of the limb about 15, oblong-orbicular, obtuse; stamens very numerous; stigma not exserted; fruit globose-oval, 2 cm. in diameter, with a few scattered spine-bearing areoles; seeds black.

Limestone cliffs, Sierra de Anafe, near Guayabal, extreme eastern part of the province of Pinar del Rio (*Brother Leon*, Nov. 9, 1911, *2819, type; 2802; Britton, Cowell & Leon 9594*).

Leptocereus arboreus sp nov.

Plant up to 5 meters high, erect, much branched. Joints 3–10 dm. long, 4–6 cm. wide, narrowed at base; ribs 4, narrow, thin, 1.5–2 cm. deep, somewhat depressed between the areoles; areoles 2.5–4 cm. or less apart; spines 10 or fewer, acicular, yellowish, becoming gray, radiating, the longer up to 5 cm. long; corolla short-campanulate, about 2 cm. long, almost enclosed in the bur-like ovary; petals cream-colored; fruit ellipsoid, 8–10 cm. long, 5–6 cm. thick, its areoles bearing tufts of numerous light yellow spines.

Rocky hillside, Punta Sabanilla, mouth of Cienfuegos Bay, Province of Santa Clara, February 24, 1910 (*Bri ton, Earle & Wilson 4573, type*); Castillo de Jagua, Cienfuegos Bay (*Britton, Cowell & Earle 10298*).

Coryphantha cubensis sp. nov.

Plants depressed-globose, tufted, 2–3 cm. broad, pale green. Tubercles numerous, vertically compressed, 6–7 mm. long, 4–5 mm. wide, about 3 mm. thick, grooved on the upper side from the apex to below the middle, the groove very distinct; spines about 10, whitish, radiating, acicular but weak, 3–6 mm. long, those of young mamillae subtended by a tuft of silvery white hairs 1.5 mm. long; flowers pale green, 16 mm. high, the segments acute.

Among small stones in barren savanna southeast of Holguin, Oriente (*J. A. Shafer 2946*).

Cactus Harlowii sp. nov.

Plants light green, 2.5 dm. high or less, simple or sometimes in clusters of 3 to 6 on the tops of old individuals. Ribs 12, rather narrow; areoles becoming glabrate, closely set (less than 1 cm. apart); radial spines about 12, slender, slightly spreading, 10 to 20 mm. long, reddish, becoming straw-colored in age; central spines 4, similar to the radials, stouter and longer, sometimes 3 cm. long, often somewhat curved; cephalium prominent, composed of white wool and fine reddish brown bristles projecting beyond the wool; flowers small, 2 cm. long, deep rose red; fruit deep red, obovoid, short, 2 cm. long; seeds black, shining.

Coastal cliffs, U. S. Naval Station, southern Oriente, March, 1909. *N. L. Britton 1965.*

Named in honor of Captain Charles Henry Harlow, U.S.N., commandant at the Naval Station at the time this interesting species was collected.

CURRENT LITERATURE

A New Paint-destroying Fungus is the title of an interesting paper by Mr. George Massee, in the *Bulletin of Miscellaneous Information of the Royal Botanic Gardens at Kew, England,* No. 8, p. 325. In this place Mr. Massee describes a new species (*Phoma pigmentivora* Mass.) which is very destructive to white paint when present in greenhouses having a high humidity and temperature. We know that certain fungi grow upon media as diverse and apparently unsuitable as dilute mineral acids, writing ink, tannic acid solutions, etc., but they do not often fruit under such conditions. However, this fungus not only grows upon the paint, but seems to flourish and even produces its fruit in abundance. At first thought it seems somewhat startling that a plant should thrive upon a medium like paint containing large amounts of lead, which is usually one of the most toxic of agents acting upon organisms. This is another example of the great flexibility and adaptability of living protoplasm to conditions apparently unfavorable in the highest degree.

About one month after the paint has been applied it begins to be dotted with small pink specks that increase in size, and finally turn purple. These blood-stain like blotches grow until they are several inches in diameter, and, of course, by this time have completely ruined the appearance of the painted structures. The spores are now produced in dark red, warty, fruiting bodies and are then liable to infect any other paint in the vicinity. Several greenhouse painters in England complain of serious losses through this agency.

When the spores of the fungus are sown on wet white paint they germinate readily and in a few weeks produce all the characteristic effects observed in the infected greenhouses. Upon pure linseed oil the spores germinate and grow for a time, but no fruit or pigment is produced. Furthermore, upon pure white lead there was no germination at all; so, both the oil and white lead seem to be necessary for the full development of the plant. The bright red pigment is produced in oily red drops inside a colorless cell wall. The nature of this pigment is unknown, but the author's suggestion that it may be due to the formation of the red oxide of lead hardly seems tenable, judging from his description of it or from the fact that it is bleached by hydrogen peroxide. Finally it was found that paint made up to contain two per cent. of carbolic acid was wholly free from infection with the organism. Here we see lead playing the part of a favorable medium for the growth of this fungus and carbolic acid acting as a fungicide.—E. D. C.

In discussing the origin of species in nature Dr. Henry Huss (*American Naturalist* for November) says: "Whoever can devote a part of his time to the study of a genus is able to establish the existence of differences, which, formerly ignored and in themselves slight, are of the greatest importance for the tracing of relationships."

Differences between the leaves of old and young shoots, variations shown by leaves of fruiting branches and adventitious shoots, the common heterophylly in the horseradish, sassafras, and the mulberries all show that plants must be studied throughout their various stages of development and through the seasons.

Variation in garden plants (in leaf, in flower color, shape, and arrangement) are common and are probably more important than they are usually considered. From similar variations reported from widely distributed points or at widely separated intervals the conclusion is drawn that a new form, which has appeared at various times and which because of the nature of the variation is incapacitated from reproducing itself by seed, would from this very fact constitute an ideal illustration of repeated mutation, since a hybrid origin of the individuals which appeared later, is excluded.—J. B.

There has long been the impression that desert plants must have very deeply penetrating root systems, quite oblivious of the fact that in most desert regions the soil water lies so far below the surface that many if not the majority of plants would be quite unable to develop roots capable of reaching it. Dr. Cannon* in a recent paper has shown that there is a great diversity in the root distribution of such forms. Those which grow in the flood plains of the rivers, as for instance the mesquite, may indeed have fairly deep roots, for the water table in such localities is within reach even in a desert. Those, on the other hand, which grow on the detrital slopes are much more likely to have shallow root systems which extend over a large area. In even the larger cacti, for instance, the tap-root is a negligible quantity except perhaps for anchorage and the superficial laterals spread out for a long distance. The water which the plants avail themselves of is the surface moisture which comes from the seasonal though brief and scanty rains of the region. In Tucson, Arizona, where there are two short rainy seasons, one in winter, the other in summer, the annuals show a difference in the development of their absorbing systems which is apparently due to the relative difference of air and soil temperatures at those

* W. A. Cannon, Root Habits of Desert Plants. Carnegie Institution of Washington. Publication 131, pages 1–96, Pl. 1–23; fig. in text 1–17, Mar. 28, 1911.

periods, rather than being due alone to the difference in the mean air temperature. It is impossible in so short a notice to bring to the attention of the reader all the many points of interest in this publication which merits a careful perusal.—H. M. R.

Professor Peirce in the October *Popular Science Monthly* discusses the relation of civilization and vegetation. Civilization, he says, in "the form of agriculture plays sad havoc with natural native vegetation, destroying, driving back, exterminating most, domesticating and assimilating few, plants." Incidentally, in referring to the disappearance of the wild races from which our domesticated forms have arisen as due to assimilation he asks, "What is the joy of living as a tame hen, as a domesticated cow, as a pruned pear tree? 'The ox that treadest out corn' is sure of daily food; so is 'the cock of the walk'; so also are the subjugated plants of farm and garden; but individuality has been sacrificed for safety."

The article also discusses the injury to plants from air and soil gases, smoke, and cement rust.—J. B.

The Monardas: A Phytochemical Study by Miss Wakeman appeared as Part 4 of Volume 4 of the Science Series of the *Bulletin* of the University of Wisconsin. Now and then one has the pleasure of reading a publication of this type in which the problem of the relations of a group of morphologically similar plants are attacked with chemical tools and it is found that the chemical relationships are also close. The genus *Monarda* contains several representatives and all are found in North America. Many of the species have bright colors and agreeable aromatic odors, so were early used by the first settlers and probably also by the Indians as "medicine" in the treatment of disease. The species are widely distributed and they go under a number of different local names.

The red pigment of the brilliant *M. coccinea* (*didyma*) was studied as early as 1832. Later, other chemists examined the volatile oils of different *Monardas* and found crystalline deposits in the oils after standing. Careful work upon authentic material was not done until begun under the direction of Professor Kremers at Madison. Numerous investigations have been made there, especially upon the essential oils of this group. The oils of *Monarda citriodora*, *M. didyma*, *M. fistulosa* and *M. punctata* were studied in detail. With the exception of *M. didyma* the oils all contained considerable amounts of aromatic phenols. Hydrocarbons like limonene were also present in several species. As a rule, all of the oils were light in color when freshly distilled but gradually turned darker in the course of time, probably owing to oxidation. This led the investigators to look for easily oxidizable substances and their search was successful, for they found that thymoquinone and certain of its derivatives were present in the oils. Now, the quinones, as a class, are often colored or yield brightly colored red, orange, or yellow substances after chemical treatment. We have here a group of closely related plants that contain substances of similar structure from the chemical point of view. A study of the part these substances play in the pigmentation of the plant was then undertaken.

The pigments of the different *Monardas* give to their flowers the red, yellow, brown and purple colors that make them attractive. These pigments are extracted with various solvents. The colors of each are different, but upon chemical study they all appear to be derived from one or two closely related mother-substances, among which thymoquinone has been obtained in the form of beautiful yellow crystals. Substances of this type give brilliantly colored final or intermediate oxidation products. It was found that the *Monardas* contain oxidases or oxidizing ferments (destroyed by heat) that can oxidize these color-producers from one stage to another with accompanying change of hue. Many investigators consider that numerous other cases of pigment formation in plants are due to the action of these oxidases upon various colorless constituents of the plant. The question of pigment production is one of growing interest among both botanists and chemists. The present publication is a valuable contribution to our understanding of this problem.

Miss Wheldale, in England, has recently published two papers that are very interesting in the same connection. One is "The Chemical Differentiation of Species," *Biochemical Journal* **5**: 445 (1911); and the other is "The Colours and Pigments of Flowers with Special Reference to Genetics," *Proceedings of the Royal Society*, Series B, **81**: 44 (1909).—E. D. C.

Under the authorship of M. F. Barrett of the State Normal School at Upper Montclair, New Jersey, there has appeared a "LEAF KEY TO THE GENERA OF THE COMMON WILD AND CULTIVATED DECIDUOUS TREES OF NEW JERSEY." The author apparently realized the impossibility of determining the different genera of trees by leaf characters alone, and frequent use is made of other but equally obvious characters. Used under the guidance of a teacher knowing the trees, the key should prove a useful pamphlet to the beginner. Some of the distinctions drawn between genera, the hickories and walnuts for example, require more botanical judgment than the unaided beginner is apt to have, but the key will be a great help in class work, where the instructor exercises considerable interpretative helpfulness. Copies may be procured from the above address and cost only ten cents each. —N. T.

The September *Mycologia* includes an article by Bruce Fink on the nature and classification of lichens; it consists chiefly of collected statements of various botanists with reference to considering lichens as a distinct class. About 83 per cent. of the 115 botanists consulted believe that the lichens should be maintained as a distinct group of plants; the balance would distribute them among other fungi to the exclusion of the group Lichenes. Forty botanists favored maintaining LICHENES, considering it a natural group. Europeans are more favorable to this division than Americans. Convenience for study is evidently considered an additional argument for maintaining the group.—J. B.

We are pleased to mention Publication No. 1 of the Botanical Society of Western Pennsylvania, issued Nov. 27, 1911. It has been projected for the publication of articles, not too deep and extended, upon the flora of the western part of the state. Besides the proceedings of the Club and reports of the administrative character, it contains papers on the Pteridophytes of Allegheny County, The Fungal Flora of Pittsburgh, and Rambles in Panama and Jamaica. It has all of the characteristics of a well-edited and interesting journal covering a local area.—N. T.

A review (*Plant World*, July, 1911) of Fitting's recent paper dealing with the relation of osmotic pressure of the cell sap in plants to arid habitats gives some interesting figures concerning the pressure found in leaf cells. The reviewer, E. B. Livingston, says that "we find that the highest pressure developed by those desert forms is more than *thirteen* times what we have hitherto considered as *usual*. They are perhaps three times as great as the pressure observed in grass stems by Pfeffer. Hereafter the highest pressures observed by ordinary green plants must be cited as at least over 100, perhaps as high as 130 atmospheres, or even higher."—J. B.

PROCEEDINGS OF THE CLUB

October 25, 1911

The meeting of October 25, 1911, was held in the Museum Building of the New York Botanical Garden at 3:30 P.M., Vice-President Barnhart presiding. Fifteen persons were present.

The scientific program consisted of informal reports on the summer's work. Dr. N. L. Britton discussed the genus *Cameraria* L. and illustrated his remarks by specimens and illustrations of the known species, together with those of an undescribed one found by him at the United States Naval Station, Guantanamo, Cuba. He also remarked on the large number of undescribed species of plants in many genera contained in the recent Cuban collections of the New York Botanical Garden.

Dr. Marshall A. Howe gave a brief résumé of a paper on "Some

Marine Algae of Lower California, Mexico," which had been accepted for publication in the November number of the *Bulletin*. The algae of Lower California have been hitherto almost unknown, only seven species having been attributed to the region. The materials on which the present paper was based give evidence of the existence there of at least thirty-four species, a good proportion of them being new to science, and it seems probable that adequate exploration of the region would show its algal flora to be rich and varied.

Dr. J. K. Small gave some brief notes on certain species of *Peperomia*, and Dr. H. M. Richards outlined some research work on acidity in cacti, which he had been prosecuting at the Desert Laboratory, Tucson, Arizona.

Meeting adjourned.

FRED J. SEAVER,
Secretary pro tem.

NOVEMBER 14, 1911

The meeting of November 14, 1911, was held at the American Museum of Natural History at 8:15 P.M., Vice-President Barnhart presiding. Forty-five persons were present.

The minutes of the meetings of October 10 and October 25 were read and approved.

Mrs. N. C. Nuris, 611 W. 177th St., New York City, and Dr. George F. Bovard, University of Southern California, Los Angeles, California, were proposed for membership. There being no further business to consider Mrs. N. C. Nuris was then elected to membership in the Club.

The announced scientific program of the evening consisted of a lecture on "Trees of New York City," by Professor C. C. Curtis. The lecture was illustrated by numerous lantern slides.

Meeting adjourned.

B. O. DODGE,
Secretary

NEWS ITEMS

Professor J. E. Kirkwood has issued a prospectus of the short course in Forestry (January to March) at the University of Montana. A score of courses are offered, many of them of a strictly botanical nature. The course is free and information thereto may be obtained from Professor Kirkwood, at Missoula, Montana.

Dr. Eng. Warming, director of the Botanic Museum and Garden, and Professor of Botany at the University of Copenhagen, resigned from his office December 31, 1911. His successor is Professor C. Raunkiaer.

At Cornell University Mr. M. Ishikama has been appointed an assistant in botany.

We learn from *Nature* (December 21) that Dr. D. T. MacDougal lectured before the Royal Geographical Society on December 18, on the North American Deserts.

Mr. Percy Wilson, of the New York Botanical Garden, has returned from Cuba, where he has been continuing the explorations of that institution in Pinar del Rio.

At a meeting of the board of estimate and apportionment of New York City on Thursday, January 18, contract was let for the construction of the first sections of the laboratory building and plant houses of the Brooklyn Botanic Garden.

At the Washington meeting, held during Christmas week, Prof. L. R. Jones was elected president of the Botanical Society of America, and Prof. D. S. Johnson, vice-president of Section G, A. A. A. S.

The following were elected officers of the Torrey Club at the annual meeting held at the American Museum of Natural History on Tuesday, January 9: *President,* E. S. Burgess; *Vice Presidents,* J. H. Barnhart and H. M. Richards; *Secretary and Treasurer,* B. O. Dodge; *Editor-in-Chief,* P. Dowell, with the following acting on the board of editors: J. H. Barnhart, Jean Broadhurst, E. D. Clark, A. W. Evans, R. A. Harper, M. A. Howe, H. M. Richards, and N. Taylor. Dr. Mansfield was elected delegate to the Council of the New York Academy of Sciences.

Vol. 12 February, 1912 No. 2

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EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

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WINTER-KILLING AND SMELTER-INJURY IN THE FORESTS OF MONTANA*

By George Grant Hedgcock

The great Washoe smelter at Anaconda, Montana, among the largest in the world, throws off annually, in spite of certain precautions taken to prevent it, a great volume of sulfur oxides and arsenic. There is little doubt, in view of the experiments made with sulfur dioxid, most of which have been made by European investigators, that this form of sulfur even when very dilutely diffused in air is injurious to plants. The fumes of arsenic take on a solid condition in open air and are probably not injurious to the foliage of forest trees. The effect of the accumulation of sulfuric acid and arsenic in the soil on the roots of plants is still somewhat uncertain, especially in small quantities. An excess, especially of the former, must undoubtedly interfere with the natural processes of decomposition and soil fertilization. The latter in large quantities can hardly fail to be poisonous.

During the winter of 1908–9 in some portions of the Northwest, more especially in Montana, many forest trees suffered from a peculiar form of injury which was apparently due to weather conditions the probable cause of which will be discussed in another paper. This injury was most severe in the following national forests: Absaroka, Beartooth, Bitterroot, Blackfeet, Deerlodge, Gallatin, Madison, and Jefferson. The injury was frequently quite severe. During the past three years, in all, about 40,000 acres of coniferous trees have died from its effects in Montana.

This form of winter injury has received the name locally of

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[No. 1, Vol. 12, comprising pp. 1–24 was issued 22 Ja. 1912.]

the "Red Belt" owing to the red appearance of the injured conifers, especially of the pines *en masse*, and the occurrence in most instances of the injured portion of the forest in narrow bands or strips of land, situated on the slopes of hills or mountains and running parallel to their bases, or to the valley floor below. The injury, judging from a consensus of observations by a number of observers, must have occurred in January, 1909, but was first noticed some time after it occurred, when the leaves began to redden and dry out. This injury took place at a time when the injury by smelter fumes in the region around Anaconda was a matter both of considerable discussion and litigation. This region reached by fumes from the Washoe smelter will be called the Smelter Zone in this paper. The matter of injury to the conifers in the Deerlodge National Forest became a matter of controversy, and the question naturally arose as to whether any of the "Red Belt" type of winter injury had occurred in the Smelter Zone.

The writer has spent a considerable portion of the past two summers making a study of the injury to trees by smelter fumes as compared with that of the winter of 1908–9 in order to separate the two forms of injury by differences apparent to the eye in the forest. It is found that while there are fine color distinctions in the two forms of injury that are easy to detect, when it comes to describing them in words, it is difficult to find terms to express these color distinctions exactly; on the other hand it is much easier to describe both their initial and final effects upon growth and behavior of the trees affected.

Smelter fumes and winter injury both redden the needles of pines in the more acute forms of each, but the smelter injury causes a brighter color and does not so often kill the whole leaf as in case of winter injury. In case of lodgepole pine and of Douglas fir trees, the Red Belt winter injury in the acute form killed not only the leaves but often the terminal buds and twigs, and the whole tree died the season following the injury. In the acute form of smelter or SO_2 injury the leaves die more gradually, and the terminal buds especially of the top shoots are the last to die. The death of such trees takes place slowly, from a more or less gradual defoliation often extending through several years;

and not from the effect of a direct and immediate injury, which killed the leaves by drying them out in a short space of time, completely defoliating and killingthe trees, as in the Red Belt.

The Red Belt injury occurred while there was a deep snow in most of the forests affected, and the younger parts of small pines and firs were injured only above the snow, the older parts covered with snow remaining green and healthy. On the other hand young trees suffering from acute smelter injury die in a reverse order, the lower limbs, and the older leaves dying first, the upper limbs and younger leaves last, the snow affording no protection in summer.

The less acute form of injury by smelter fumes usually known as chronic injury, causes a much slower defoliation of coniferous trees than the acute form. In lodgepole pines and firs, the leaves gradually lose their bright green color and become chlorotic, usually with a reddish tinge. All gradations between this appearance in typical chronic injury and the brightly reddened needles the acute form are found. In both forms the older needles are killed first, but in the chronic form, death takes place more slowly than in the acute.

In the less acute forms of Red Belt injury few terminal buds or twigs were hurt and only the leaves were affected. The leaves were reddened where the tips were killed, and in many instances the trees were nearly defoliated by the death of the needles in 1909. New green leaves, however, were put forth from the terminal buds of the less severely injured trees; some of these were chlorotic in appearance. Slightly injured trees lost only a portion of the foliage and recovered their growth at once.

A third form of smelter injury has been inaptly named invisible injury in Germany. This consists in a gradual and premature defoliation of the trees accompanied by a slight chlorosis and change of appearance in the leaves. This form checks the growth of the trees, and often at a later date assumes chronic form.

In all the forms of smelter injury in the smelter zone about Anaconda the general effect has been to form decreased annual wood rings year by year as the defoliation becomes more complete, until the width of a ring is often so slight that a powerful lens is necessary to measure its diameter. In such extreme cases little or no autumn wood is produced in the rings. This tapering in growth in the wood rings is most pronounced in acute smelter injury, and the date of the first injury is often graphically shown by the first lessened annual ring, especially in young conifers.

On the other hand, coniferous trees injured in the Red Belt regions, entirely out of the Smelter Zone, do not as a rule show a gradual decrease in the annual increment for the past 5 to 10 years, as is shown by trees in the regions of acute and chronic injury in the Smelter Zone. In the most acute Red Belt injury, trees died suddenly after years of rapid and steady growth; in less acute forms where the trees recovered, there was little or no growth in 1909, followed by increasing growth or increment in the wood for 1910 and 1911.

The forested area in which the trees were killed by Red Belt injury was small when compared to the total area of the forests affected.

In Deerlodge National Forest, in the Smelter Zone, no greater percentage of the forest has suffered from Red Belt injury than has occurred in adjacent forests, in fact, according to the data collected by the writer, there is less of this injury.

The amount of damage in the same area in the Deerlodge National Forest due to wood-rotting fungi is no more than that in adjacent forests. Old and mature Douglas firs and pines are diseased occasionally with heart rots caused by *Polyporus Schweinitzii* and *Trametes pini*. On the other hand certain rusts, as *Peridermium elatinum*, *P. coloradense*, and species of *Phragmidium*, *Melampsora*, and *Roestelia* are almost entirely absent from the Smelter Zone around Anaconda, although often present in abundance in adjacent forests beyond this zone.

A great difference in the ability of conifers to withstand the effects of smelter fumes has been noted. The species in the Smelter Zone named in order of susceptibility to injury are as follows:

1. *Abies lasiocarpa* (Hook.) Nutt. (Alpine fir).
2. *Pseudotsuga taxifolia* (Lam.) Britt. (Douglas fir).
3. *Pinus contorta* Loud. (lodgepole pine).

4. *Picea Engelmanni* (Parry) Eng. (Engelmann's spruce).
5. *Pinus ponderosa* Laws. (western yellow pine).
6. *Pinus flexilis* James (limber pine).
7. *Juniperus scopulorum* Sarg. (Rocky Mountain juniper).
8. *Juniperus communis* L. (dwarf juniper).

The last three named species are quite resistant and in Deerlodge National Forest in the Smelter Zone show little or essentially no injury from smelter fumes.

The ability of trees to withstand the Red Belt form of injury is not in the same ratio as that of their resistance to smelter fumes. In order of the susceptibility to winter injury the species above named are as follows:

1. *Pinus ponderosa.*
2. *Pseudotsuga taxifolia.*
3. *Pinus contorta.*
4. *Pinus flexilis.*
5. *Picea Engelmanni.*
6. *Abies lasiocarpa.*
7. *Juniperus scopulorum.*
8. *Juniperus communis.*

All species showed some injury in the Red Belt winter injury of 1908–9. *Pinus flexilis*, *Juniperus scopulorum*, and *J. communis* exhibited, so plainly, forms of injury that the health of these species in the portions of the Smelter Zone where they are found is taken as proof that no winter injury has occurred in these regions during recent years.

The leaves of aspens (*Populus tremuloides* Michx.), alders (*Alnus tenuifolia* Nutt.), and of willows (*Salix* spp.) exhibit peculiar forms of leaf scorch, blackened, reddened, or discolored areas of parenchyma which are not found on leaves of the same species in other regions, in adjacent forests subjected to the Red Belt winter injury, but not to smelter fumes.

In much of the inner portion of the Smelter Zone adjacent to the smelter, few or no seed are borne by conifers, and little or no reproduction is taking place. The seedlings, apparently, are killed as soon as they appear above the ground. Not so in areas outside of the Smelter Zone, where only winter injury has occurred. In such localities, reproduction is gradually beginning to take place.

In no other portion of Montana do we have a zone of injury comparable to that surrounding the Washoe smelter at Anaconda, where radiating from a central point, the injury decreases gradually outward in every direction from a common center. In this region where variation in the bands of injury occur, they can be shown to be due to the tendency of the clouds of smoke in damp weather either to settle in the valleys or to follow the easiest channels of surface configuration, here thrown against a slope, and there deflected away by striking a protected slope or valley.

Acknowledgment should be made to Messrs. W. B. Greeley, assistant forester, and F. A. Silcox, district forester of District No. 1 of the Forest Service, for their courtesy in securing data on the time of occurrence of the Red Belt injury of 1908–9, its scope, and extent; and to Messrs. J. F. Preston, D. T. Conkling, D. T. Mason, R. P. McLaughlin, C. W. Hudson, forest supervisors, and others of the forest service who contributed the data just mentioned.

Office of Investigations in Forest Pathology,
Bureau of Plant Industry,
Washington, D. C.

THE GENUS HAMELIA JACQ.

By N. L. Britton

Mr. H. F. Wernham has recently contributed to the Journal of Botany* a very useful account of *Hamelia*, a genus of Rubiaceae, comprising, according to his studies, twenty-eight species, all American, ranging from Florida and Mexico to Paraguay.

Of the twenty-eight species recognized, the following are described as new:

H. magniloba. Nicaragua.

H. grandiflora Spruce. Chimborazo.

*Jour. Bot. **49**: 206–216. Jl 1911. A supplementary note, loc. cit. 346. N 1911.

H. magnifolia. Costa Rica.

H. ovata. Venezuela.

H. Rovirosae. Tabasco; Guatemala.

H. pedicellata. Colombia; Venezuela; Trinidad; Dominica; St. Vincent.

H. tubiflora. Colombia.

H. viridifolia. Costa Rica.

H. brachystemon. New Grenada.

H. Brittoniana. Costa Rica.

Hamelia axillaris Sw. of Jamaica, reduced by Grisebach to *H. lutea* Rohr, is maintained as a species, on the evidence of the specimens collected long ago by Swartz and by W. Wright, preserved in the herbarium of the British Museum, but this does not appear to be conclusive, and *axillaris* is the older name. For this species Mr. Wernham cites also *Tonduz 9998* in the Kew Herbarium, but this is from Costa Rica not Jamaica.

H. pedicellata Wernham does not appear to be certainly distinct from *H. erecta* Jacq. (*H. patens* Jacq. a posterior name) from which it is separated by its scanty pubescence and "mostly" pedicelled flowers; but some of the flowers of *H. erecta* are often pedicelled, and as Mr. Wernham remarks, the pubescence of *erecta* is a very variable quantity.

To the genus may be added:

Hamelia scabrida sp. nov.

A small tree, 4 m. high. Leaves opposite, or those of small twigs whorled in 3's, broadly ovate, rather firm in texture, the blade 10 cm. long or less, short-acuminate at the apex, rounded or narrowed at the base, scabrate with numerous scattered short conic papillae on the upper surface, pubescent and with some similar papillae on the veins beneath; veins about 7 on each side of the midrib, widely ascending; petioles 2 cm. long or less; stipules triangular, subulate-tipped; flowers sessile or short-pedicelled, secund on the branches of terminal forking cymes; calyx campanulate, glabrous, 3–4 mm. long, its teeth triangular, abruptly subulate-tipped, 1–1.5 mm. long; corolla yellow, narrowly funnelform, 3–4 cm. long, its lobes 3 mm. long, obtuse; stamens and style very nearly as long as the corolla; berry oblong, 10–14 mm. long, 8–9 mm. in diameter; seeds 1 mm. long, shining, distinctly minutely tuberculate.

Rocky thicket, Fairfield, Parish of Manchester, Jamaica, September 3–7, 1909 (*Britton 3147*).

In Mr. Wernham's arrangement this comes next to *H. ventricosa* Sw., and is, in fact, nearest related to that species, which has different foliage, larger corolla and much smaller seeds.

The leaves of *H. scabrida* are quite as papillose as those of *H. papillosa* Urban of the Jamaica Cockpit Country, which has very much smaller flowers and globose fruits over 1 cm. in diameter.

FOSSIL FLOWERS AND FRUITS.—II

By T. D. A. Cockerell

The genus *Robinia* was formerly distributed over the Palaearctic region, as shown by a number of well-preserved fossils in the European Tertiary. A species (*R. arvernensis* Laurent) flourished in south-central France as late as the "Mio-pliocene." Probably the genus died out in Europe during the glacial period. At the present time conditions are well suited to *R. pseudacacia*, which has run wild extensively. In America, we have a species (*R. Brittoni* Ckll.) from the Florissant Miocene but it might have been supposed that the genus was really of Old World origin, and came over to America in Miocene times. Such an idea seems to be negatived by the discovery of pods of an apparently genuine *Robinia* in the Laramie Cretaceous.

Robinia mesozoica n. sp.

Pods of the same size and general appearance as those of the modern *R. pseudacacia* L.; base moderately tapering; apex with a short oblique point but otherwise rather obtuse; breadth of a large pod 14 mm., of a smaller but apparently mature one 10; wing-margin very distinct, nearly 3 mm. broad in the larger pod; seeds placed almost transversely, the obliquity very slight, as in the modern *R. pseudacacia*. Neither pod shows the whole length.

Collected by Mr. N. E. Hinds in sandstone, south side of a yellow cliff a few miles north of Whitely Peak, which is about

25 miles north of Kremmling, Colorado; Aug. 27, 1911. The formation was at first supposed to be Mesa Verde, but there seems to be no doubt that it is Laramie. A leaf of "*Platanus*" *Raynoldsii* Newberry is on the same piece of rock, one side touching the pods. The specific name chosen may be considered to

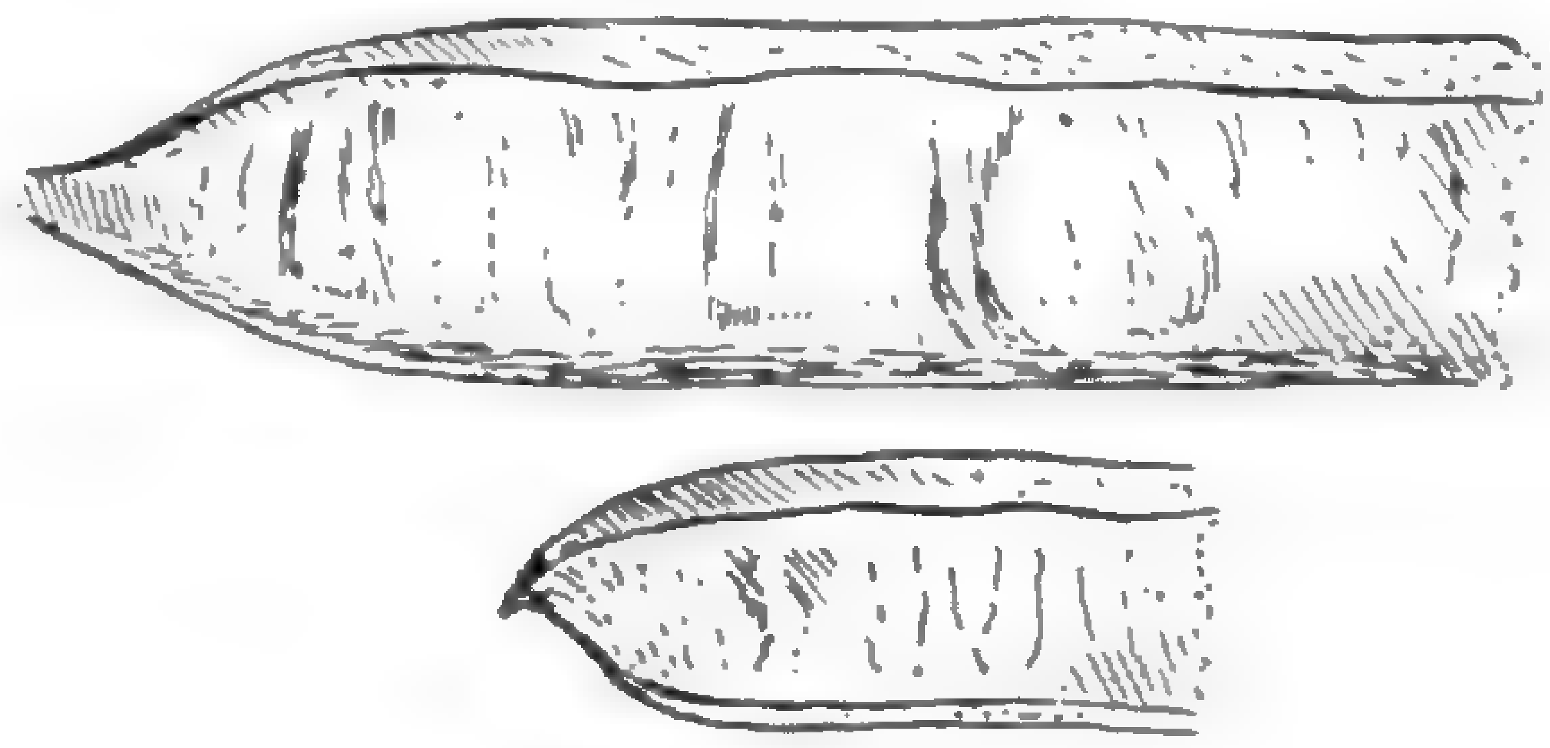

FIG. 1. *Robinia mesozoica.*

refer to the fact that the plant comes from the late Mesozoic, and also to its occurrence in that middle period of time, between the typical Mesozoic and the dawn of the Tertiary, represented by the Laramie and other formations.

A similar pod, possibly also a *Robinia*, has been described by Knowlton from the Yellowstone as *Acacia lamarensis*. The chief difference is that in the Laramie plant the seeds are placed very obliquely in the pod.

Leucaena coloradensis Cockerell

A very good pod of this species, containing a number of seeds, was found by Mr. Geo. N. Rohwer at station 17 in the Miocene shales of Florissant. The seeds are obliquely placed, exactly as in the living *L. Greggii* Watson, and are about 6 mm. long and 4.33 broad; their apices are about 2 mm. distant from the opposite margin of the pod.

BOULDER, COLORADO.

SHORTER NOTES

NEW NAMES FOR GAMOPETALOUS PLANTS.—In order to show correct relationship with accepted genera the following nomenclatorial changes are proposed.

Amarella Hartwegi (Benth.) n. comb.; *Gentiana Hartwegi* Benth. Pl. Hartw. 47. 1840.

Amarella mexicana (Griseb.) n. comb.; *Gentiana mexicana* Griseb. Gen. Sp. Gent. 243. 1839.

Cirsium Flodmanii (Rydb.) n. comb.; *Carduus Flodmanii* Rydb. Mem. N. Y. Bot. Gard. **1**: 451. 1900.

J. C. Arthur

REVIEWS

Dinsmore's Plants of Palestine*

Mr. Dinsmore's paper is practically a checklist of the plants now definitely known to occur in Palestine. From this list are omitted the various species and some genera heretofore credited to Palestine in Post's Flora of Syria, Palestine and Sinai and in the older Flora Orientalis by Boissier, now believed to be extra-limital, or included in other species under older names. A careful census of the first half of the list and of scattered genera through the remainder show that Mr. Dinsmore's checklist includes a few score species not credited to Palestine in the mentioned earlier floras. This number proves rather smaller than might be expected from a region where continuous exploration and collecting have given opportunities far beyond those available to the earlier writers.

The arrangement, or classification, is that of DeCandolle, in the main, and follows almost *seriatim* the arrangement given in Post's Flora. The Latin names of families, genera and species are accompanied by proper abbreviations for the respective authorities, but there are no further references to the places of publication and occasionally a species is named after some authority where only close study of synonymy would show it to be not applicable to the original authority for the same name; in some cases referring to the same species, in others referring to different species.

The species in Mr. Dinsmore's list are numbered and are accompanied by five arbitrary signs which indicate the uses or

* Dinsmore, J. E.—Die Pflanzen Palästinas. Auf Grund eigener Sammlung und der Flora Posts und Boissiers, mit Beigabe der arabischen Namen von Prof. D. Dr. G. Dalman, pp. 1–122. J. C. Hinrichs'sche Buchhandlung, Leipzig, 1911.

cultivation, or distribution of the various species for the general regions indicated in Palestine.

This list seems to have its chief value in its accompaniment of arabic names for such species as are identifiable and for those species concerning which there is little doubt in the application of native names. These arabic names are distinguished so far as authoritative use is concerned by initials after those who have made special study or who have already published such arabic equivalents. The noticeable feature of these arabic equivalents is the large number of them whose application to species botanically known is the authoritative work of Professor Dalman. Were it not for these additional arabic terms, which must be of great reference value to any one understanding the arabic language and having occasion to deal in any way with Palestine plants, it would seem that the time and money invested in this list had been unwisely expended, for the classification is now far out of date and in no wise departs sufficiently from DeCandolle and Post to be of individual value. It is to be regretted that the pamphlet was not written with the classification of Engler's Syllabus which represents the most widely accepted classification in present-day use.

It should be borne in mind that Mr. Dinsmore was limited to conditions in the city of Jerusalem, under which it is exceedingly difficult to do the highest grade of scientific work, due to the almost entire absence of library facilities and on account of the long distance to extensive collections where thorough and adequate comparison of material could be made.

It is quite probable, too, that Mr. Dinsmore had no opportunity to study Decaisne's Florula Sinaica, Ann. Soc. Nat. Paris, 1836; Lowne's Flora of Sinai, Jour. Linn. Soc., 1865; Tristram's Fauna and Flora of Palestine, Palestine Exploration Fund, London, 1884; the manuscript catalog of the Flora of Palestine, by Hanbury and J. Hooker (at Kew); or Hart's Some Account of the Fauna and Flora of Sinai, Petra and Wâdy' Arabak, Palestine Exploration Fund, London, 1891.

The author of the list has introduced a few forms under already recorded species, which forms appear by the character of publication to be new, but if they have not been previously published in some other journal, they must be relegated to the already regrettably extensive list of *nomina nuda*. This unfortunate condition would not have obtained had Dinsmore appended a few terms of characterization by which the new forms could be distinguished from the species to which they are related.

The general summary is, then, that Dinsmore's Die Pflanzen Palästinas is a *seriatim* list of the plants of Palestine quoted from Post's Flora of Syria, Palestine and Egypt limited to those known to Mr. Dinsmore to occur in Palestine; accompanied by the already published arabic equivalents on the authority of Boissier, Bauer, Hadded, etc., with the addition of other arabic equivalents on the authority of Dalman; prepared without reference to the entire reclassification of plants which has been so actively carried out during the last twenty-five years, a reclassification almost universally adopted in botanic centers and in educational institutions.

E. L. Morris

CURRENT LITERATURE

In 1904 K. M. Wiegand and F. W. Foxworthy issued a key to the genera of woody plants in winter. This valuable little pamphlet of 33 pages has run through several editions and was perhaps the best known treatment of the subject until the present time. From the Storrs Experiment Station we have just received a much more elaborate work* covering a similar field.

After a preface acknowledging the chief sources of information and a short bibliography, the authors take up in the introduction, first, the question of "Names." Throughout they have given the commoner vernacular names of each species as well as the ". . . one scientific name at present sanctioned by botanical authorities." Naturally these are the names maintained in the new Gray Manual, and the authors are to be congratulated upon

* Blakeslee, A. F., and Jarvis, C. D. New England Trees in Winter. Bull. Storrs Agr. Exp. Sta. **69**: 307–576. [Je] 1911. Storrs, Conn. [Received in December, 1911.]

the adoption of this admirable system, which enforces a minimum of botanical orientation upon the user. However unscientific it may be to place the white pine under *Pinus* (instead of *Strobus*) and the choke cherry under *Prunus* (instead of *Padus*), it is nevertheless true that for the vast majority of the students who will use the work in hand, generic and specific segregates do not aid, but usually obstruct, the path of those who look in the old familiar genera for their commoner tree friends.

The introduction also includes such items as habit, twigs, leaf-scars, buds, fruit, etc. Each of these, and several other aids in the determination of trees in their winter condition, are discussed in detail, always from the viewpoint of the general reader and lumberman. A general key to the genera and individual keys to each genus complete the introductory matter. It may be found that the keys will require more familiarity with such things than the average user of the work will have, but they are excellent and have been drawn with admirable fidelity.

The body of the work contains a detailed description of habit, bark, twigs, leaf-scars, buds, fruits and wood, together with a discussion of the distribution and a comparison with other trees with which the one in hand might be confused.

Nearly all the native trees are treated thus, and a number of introduced species that are practically wild, or so widely cultivated that they attract as much attention as native species. For each species there is a splendid composite photograph showing general habit, character of bark and of the branches and twigs. Frequently, also, the fruits and nuts are shown. There is a comprehensive index and a glossary of botanical terms, which in the text have been avoided wherever consistent with accuracy.

After the large crop of the "How to Know" books, and numberless compilations, great and small, the jaded tree-lover will turn with avidity to this excellent study of the trees in winter. For reasonableness of nomenclature and practicality of taxonomic treatment, for a certain thoroughness and freshness of handling, the work is immeasurably in advance of any recent publication upon the subject. Some discussion of the altitudinal preferences of the different species would have been welcome, but such a small lack in a work so generally excellent is not to be taken seriously.*—N. T.

Dr. W. J. Gies, consulting chemist of the New York Botanical Garden and professor of biological chemistry in Columbia University, has been very active in the establishment of the *Biochemical Bulletin*, the first number of which appeared recently. This publication, which is to appear quarterly, each volume containing about five hundred pages, is the official organ of the Columbia University Biochemical Association. In addition to the publication of biochemical research, this organ aims to extend general biochemical knowledge and furnish a means of keeping the workers in the home laboratories in closer touch with those who have gone out to other fields of labor. The first number contains 160 pages and is devoted to scientific papers and notes and news of a biochemical nature. One of the papers (pp. 7–41, with three plates) is by Professor F. E. Lloyd, and is entitled, "The tannin-colloid complexes in the fruit of the persimmon, *Diospyros*." We understand that the *Biochemical Bulletin* will aim to give special encouragement to the development of chemical studies in botany and that chemical papers on botanical subjects will be welcomed to its pages.—From the *Journal of the New York Botanical Garden.*

H. D. Tiemann in *American Forestry* for April calls attention to the fact that wood workers know too little of the structure of wood. To the engineer, carpenter, and manufacturer the microscopic structure of this material ought to be most illuminating. It would answer such questions as the following: "Why is white oak more lasting and better wearing than red oak, and why is the former suitable for light cooperage while the latter is not? Why are firs so difficult to treat with preservatives and pines so easy? Why is eucalyptus so difficult to dry?"—J. B.

The Flora of the Raritan Formation. (Edward W. Berry. Geological Survey of New Jersey, Bulletin No. 3. 8vo, pp. 1–233,

* The work is being republished by the authors in book form. The original issue of the bulletin was free, but is now practically exhausted.

pls. 1–29+f. 1–5. Trenton, 1911.)—This contribution to Cretaceous paleobotany is largely a compilation of previous work by the author and those who preceded him in the investigation of the Raritan flora, although descriptions and figures of a few new species are included in it. About 100 of the 128 plate figures of fossil plants are reproductions of figures in Newberry's Flora of the Amboy Clays, the type specimens of which are in the museum of the New York Botanical Garden where, the author gracefully states, "they are well arranged and easily accessible." Numerous incidental references may also be found to other type and figured specimens in the museum, collected by Dr. Arthur Hollick in Long Island, Block Island and Martha's Vineyard.

Although it adds but little that is new to science, as a handy reference work to the flora of the Raritan formation in New Jersey it is useful, especially as many necessary corrections in nomenclature have been brought down to date. Unfortunately, however, the work is seriously marred by innumerable typographic errors and other lapses due, apparently, to careless editing.—Arthur Hollick.

Mechanism favorable to insect pollination in cruciferous flowers is discussed in *Nature* (September 21) under a criticism of a recent German book by Günthart. Crucifers generally show (1) petal claws which "bend away from the lateral stamens as if to leave definite 'entrance slits' to the assumed nectar-containing pouches of the lateral sepals"; (2) the anthers of the longer stamens are commonly twisted on their filaments so as to face round toward the adjacent lateral ones, as if with the intention of rubbing the entering proboscis of an insect; (3) the edges of the filaments are frequently extended into elaborate appendage growths which are apparently intended to guide the proboscis of the insect visitor to the secreting surface.—J. B.

Mendelism. (Professor R. C. Punnett of the University of Cambridge. Published by The Macmillan Company, New York. 12mo, price by mail $1.38.)—The third edition of Punnett's treatise on Mendelism has recently appeared. This volume gives a concise exposition of the original Mendelian doctrine together with the various modifications which have developed from recent investigations in genetics. The conceptions of the Cambridge school of genetics, especially in reference to the Presence and Absence Hypothesis, are well presented.

The general non-technical treatment, the clear statement of principles, the careful presentation of experimental data drawn from investigations with both plants and animals, and the use of excellent diagrams and illustrations combine to make the book of unusual interest to the general public.

It is to be regretted that, in spite of criticisms on the former editions, the author continues to define ovules and pollen grains as gametes. The development of the male and female gametophytes in flowering plants with the subsequent act of fertilization is thus presented: ' The pollen cell bores its way down the pistil to reach an ovule." In even a popular discussion of principles depending on definite factors which gametes bear, it is difficult to understand why the sex generation should be so lightly disposed of.

A few words upon this phase would give this interesting popular treatise an additional accuracy that is in keeping with well-known morphological facts.—A. B. Stout.

The Plums of New York. (Hedrick, U. P. Eighteenth Annual Report of the Department of Agriculture. State of New York, Vol. 3, Part II, or Report of the New York Agricultural Experiment Station for the Year 1910, II, pages viii+616. Albany, 1911.)—In the writing of this bulky volume, Hedrick has been assisted by R. Wellington, O. M. Taylor, W. H. Alderman and M. J. Dorsey. The Plums of New York is the third monograph of the fruits of New York State, the two preceding reports being on apples and grapes respectively. Broadly speaking, the work, which is illustrated by 108 beautifully colored plates of plums, is a horticultural and not a botanical work and yet it is of greatest value to the botanist. The book has been written for New York, but its contents are so general in character that it applies to the whole country and more or less to the world.

The first chapter is an historical account and a botanical classification of plums; the second a discussion of the present status of plum-growing in America; while the third and fourth are devoted to varieties of plums. The first and last two of these chapters contain the synonymy and bibliography of the species and varieties of plums. In the footnotes running through the book are given biographical sketches of plum growers.—JOHN W. HARSHBERGER.

In a recent text book of Egyptian agriculture edited by G. P. Foaden and F. Fletcher attention is called to the fact that the important staple crops are remarkably free from fungous diseases. Berseem and maize, although grown in enormous quantities, are practically free from disease; wheat only bears rust-pustules, commonly after the flowering period; and although cotton is inhabited by four common fungi, it is attacked by them at such times as to be but little affected by them. This is at least partly due to the climatic conditions: high temperatures unfavorable to fungi, and the unvarying character of the climate. —J. B.

An exceedingly attractive series of leaflets is issued from the Arnold Arboretum under the title of *Bulletin of Popular Information.* Number 11 of the series contains a discussion of the English elm, or rather, of the English elms, for there are two that ". . . grow naturally and spontaneously in Great Britain, *Ulmus glabra* and *Ulmus nitens.*" Besides these two, there are two other species in northern and central Europe, *U. laevis* and *U. foliacea,* all in cultivation at the arboretum.

"When we speak [broadly] of *Ulmus campestris* we do not refer to any of these trees . . . , but to the so-called elm of the roadsides, avenues, and hedgerows of southern England. The origin of this tree is obscure. Growing spontaneously it is known only in England; it never ripens seed and it increases by suckers which are produced in profusion. Some authors have thought that it might be a hybrid; by others it has been suggested that it was brought from Italy to Britain by the Romans. . . . The oldest name of this tree is *Ulmus surculosa.*"

The statement is made that most of the seedlings imported from Europe as *U. campestris* are *U. foliacea*, and this has led to the confusion in this country in the identity of the English and European elms.

The *Bulletins* are published at frequent intervals during the growing season and are free.—N. T.

Volume 1, No. 1, of the Brooklyn Botanic Garden *Record* has just been issued. It is a quarterly, and according to its foreword, ". . . is purely an administrative organ, and is not intended either as a scientific publication or as a newspaper, but, as its name indicates, to serve as a record of the development and progress of the Garden, and as a medium of communication between the Garden and its constituency. One of the numbers of each volume will contain the Annual Report of the Director of the Garden."—N. T.

PROCEEDINGS OF THE CLUB

November 29, 1911

The meeting was held in the laboratory of the New York Botanical Garden and was called to order at 3:40 p.m. by the acting secretary in the absence of other officers. Ten persons were present. The reading of minutes and the transaction of business were passed over and the meeting proceeded with the scientific program. The first announced paper was by Mr. Arlow Burdette Stout on "The Characteristics of the Fungus *Sclerotium rhizodes* with special Reference to its Action on the Cells of its Host," of which the following is an abstract:

Mr. A. B. Stout presented in part the results of his investigations of the fungus *Sclerotium rhizodes* Auersw., a complete report of which will soon appear in a research bulletin of the Wisconsin Agricultural Experimental Station.*

Special mention was made of the behavior of the fungus in

* A more complete abstract than is here given appeared in Phytopathology, 1: 69.

the different organs of the host plant and microscopical preparations were exhibited demonstrating the relations of the fungus to the cells of its principal host *Calamagrostis canadensis*.

The fungus is coexistent in leaves, buds, stems, rhizomes and roots of the infected plants. Filaments of the fungus also form a thin weft on the exterior of the roots and extend out into the soil.

In the leaves the fungus is vigorously parasitic. In the culms fungal filaments are most abundant in the region of the nodes, but there is almost no destruction of tissues. In the underground parts of the culms and in rhizomes the hyphae completely digest the cell contents of cortical cells, but have no effect on the cell walls except at the points of actual penetration. In the older portions of roots the hyphae are scattered through the cortex, where they occupy empty cells. In the younger lateral roots the filaments of the fungus are found penetrating living cells and exhibiting characteristics which have been ascribed to mycorhizal fungi. Ultimately, however, the cell contents disappear while the fungus remains intact.

The fungus is perennial in the soil, and in the underground portions of the host. It is present in buds, but is unable to penetrate into the growing apex.

The fungus, therefore, exhibits a varying degree of parasitism in the different parts of the host.

The presentation of the second announced paper, "Studies on the Growth and Reproduction of Certain Species of *Ascobolus*," by Mr. Bernard O. Dodge, was omitted on account of the illness and absence of Mr. Dodge.

Mrs. N. L. Britton exhibited drawings and microscopic preparations illustrating certain types of thickening in the cell walls of the leaves of mosses.

Dr. N. L. Britton discussed the characters of a new species of *Elaeagia* from Cuba. This is a Rubiaceous shrub 8 or 10 feet high, with fruit imperfectly known. The hitherto known species of the genus *Elaeagia* occur in the Andes of South America and this new plant from the mountains of Cuba forms another link in the chain of relationship between the flora of the higher altitudes of the West Indies and that of the mountains of South America.

After discussion of the various papers, adjournment followed.

Marshall A. Howe,
Secretary pro tem.

NEWS ITEMS

We learn from *Science* that Mr. J. C. Th. Uphof, of Amsterdam, author of "Die Pflanzengattungen," has been appointed gardener for the Botanical Garden at the Michigan Agricultural College. He will also do work in connection with the herbarium. He is expected to enter upon his duties in the latter part of February.

Dr. Jean Baptiste Edouard Bornet, well known for his morphological and taxonomic writings on the algae, died at his home in Paris on December 18, 1911, aged 83 years. He was associated with Gustave Thuret in the publication of the classical "Notes Algologiques" and "Études Phycologiques" which did much to lay the foundations of an accurate knowledge of the structure and modes of reproduction of the marine algae. Figures from the detailed and beautifully artistic plates of these works have been familiar to students of the standard botanical textbooks for the past thirty years.

At the University of Pennsylvania Mr. F. W. Pennell has been granted a fellowship in botany and Mr. J. Y. Pennypacker a botanical scholarship.

Dr. C. B. Robinson, for several years connected with the Philippine Bureau of Sience, has returned to New York. His address, for the present, will be the New York Botanical Garden, where he will continue his studies on the flora of the Philippines, and on the family Vacciniaceae.

Vol. 12 March, 1912 No. 3

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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Central Museum,
Eastern Parkway, Brooklyn, N. Y.

TORREYA

March, 1912

Vol. 12 No. 3

PRIZE ESSAY ON THE LOCAL FLORA

A series of prizes is to be offered by a member of the Torrey Club for the best popular article on some feature of the vegetation of our local flora range.*

The prizes will be as follows:

1. A first prize of $25.00.

2. A second prize of $15.00.

3. For the five next best articles, a year's subscription to Torreya. (Offered by the Club.)

The donor has delegated to the editorial board of the Club the arrangement and judging of the competition. With his consent they announce the following rules:

1. The competition is open to all amateurs, school teachers and others not on the staff of a botanic garden, college, or university.

2. Mere taxonomic revisions of genera or families will be excluded, but the essay may take any other feature of the local flora as its subject.

3. Articles should not be more than 4,000 nor less than 2,000 words long, and may or may not be accompanied by photographs, the expenses being of publication being borne by the Club.

4. The essays awarded first and second prizes will be printed in Torreya. No manuscripts will be returned and the editors reserve the right to use any competing manuscript, as they see fit.

In submitting essays it should be borne in mind that the

* The local flora range as prescribed by the Club's Preliminary Catalogue of 1888 is as follows: All of the state of Connecticut; Long Island; in New York the counties bordering the Hudson River up to and including Columbia and Greene, also Sullivan and Delaware counties; all of New Jersey; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill, Montgomery, Philadelphia, Delaware and Chester counties in Pennsylvania.

[No. 2, Vol. 12, of Torreya, comprising pp. 25–44, was issued 15 F 1912.]

editors will consider, besides the botanical value of the articles, their literary worth, timeliness, also the care and accuracy used in their preparation. Specimens should be available, on request, for verification of names cited in the articles. It is desirable, but not obligatory that all manuscripts be typewritten, but this will have no effect on the judges' decision. They must, however, be written on one side of the sheet only.

Note: No manuscript will be considered to which the author's true name is affixed. All articles must be signed by some pseudonym, and a key to the latter sent in with the article in a separate sealed envelope, marked on the outside "Key to . . . . . ," etc. After deciding as to the relative merits of the various articles the judges will open the envelopes containing the identifications of the pseudonyms.

All manuscripts must be mailed so as to be in on or before October 1, 1912. They should be sent to the editor of TORREYA,

NORMAN TAYLOR

CENTRAL MUSEUM,
EASTERN PARKWAY,
BROOKLYN, N. Y.

KEY TO THE WILD HERBS FLOWERING IN THE SPRING *

BY CHESTER ARTHUR DARLING

1 *a.* Flowers distinctly yellow, not at all red nor merely with a yellow center . . 2.
b. Flowers not yellow . . . . 72.
2 *a.* Flowers irregular, one petal modified into a swollen sac 1 in. or more long; leaves several, ovate, with entire margin.
Yellow Moccasin-flower. (*Cypripedium hirsutum.*)
b. Flowers not completely as in *a* . . . . 3.
3 *a.* Leaves in 1 or 2 whorls on an upright stem; flowers ½–1 in. broad, curving beneath the upper leaves; styles conspicuous.
Indian Cucumber-root. (*Medeola virginiana.*)
b. Plants not completely as in *a* . . . . 4.

* This key is designed as an easy means of determining, in the field, the wild herbs to be found about New York City during the spring months or until June. In using the key it is always desirable to read both *a* and *b* before choosing between them; accuracy in observation and in following the key is of first importance. Additional copies may be had for 10 cents by addressing the author at Columbia University, New York City.

4 *a.* Leaves grass-like; perianth 6-parted, greenish outside.
Star-grass. (*Hypoxis hirsuta.*)
b. Leaves not grass-like . . . . 5.
5 *a.* Flowers small, usually without stalks, arranged in more or less compact heads . . . . 6.
b. Flowers not completely as in *a* . . . . 22.
6 *a.* Leaves compound with 3 leaflets . . . . 7.
b. Leaves not with 3 leaflets; heads of flowers subtended by an involucre of green bracts . . . . 10.
7 *a.* Stipules toothed at the base; seeds black when ripe.
Blackseed Hop Clover. (*Medicago lupulina.*)
b. Stipules not toothed at the base . . . . 8.
8 *a.* Terminal leaflet distinctly stalked.
Low Hop Clover. (*Trifolium procumbens.*)
b. Terminal leaflet not distinctly stalked . . . . 9.
9 *a.* Leaflets $\frac{1}{4}$–$\frac{1}{2}$ in. long; heads loosely flowered.
Loose-flowered Hop Clover. (*Trifolium dubium.*)
b. Leaflets $\frac{1}{2}$–1 in. long; heads densely flowered.
Hop Clover. (*Trifolium aureum.*)
10 *a.* Leaves all basal, deeply lobed; flowering stalk hollow; plant exudes a milky juice when broken . . . . . **Dandelion.** (*Taraxacum Taraxacum.*)
b. Plants not completely as in *a* . . . . 11.
11 *a.* Stem very hairy; leaves bract-like, the large basal leaves wanting at flowering time . . . . . **Colt's-foot.** (*Tussilago Farfara.*)
b. Plants not completely as in *a* . . . . 12.
12 *a.* Plants white-woolly throughout; leaves entire.
Cudweed. (*Gifola germanica.*)
b. Plants not completely as in *a* . . . . 13.
13 *a.* When open all flowers in the head with irregular, strap-shaped corolla, as in the Dandelion . . . . 14.
b. Only outer flowers in the head with an irregular, strap-shaped corolla, the inner ones tubular, as in the Daisy . . . . 17.
14 *a.* Flowering stalk with 1 head. . . . . 15.
b. Flowering stalk with 2 or more heads. . . . . 16.
15 *a.* Basal leaves entire; head 1–2 in. broad. . . **Hawkweed.** (*Hieracium pilosella.*)
b. Basal leaves usually toothed or lobed; heads $\frac{1}{4}$–$\frac{3}{4}$ in. broad.
Dwarf Dandelion. (*Adopogon carolinianum.*)
16 *a.* Basal leaves with purplish veins; stem leaves not clasping.
Rattlesnake-weed. (*Hieracium venosum.*)
b. Basal leaves not with purplish veins; stem leaves clasping.
Cynthia. (*Adopogon virginicum.*)
17 *a.* Heads 2–4 in. broad; plant covered with long hairs throughout; leaves usually entire. . . . . . **Yellow Daisy.** (*Rudbeckia hirta.*)
b. Plants not completely as in *a* . . . . 18.
18 *a.* Outer flowers with a brown or purple base; leaves pinnately divided.
Garden Tickseed. (*Coreopsis tinctoria.*)
b. Plants not completely as in *a*. . . . . 19.
19 *a.* Outer flowers with corolla 3–7-lobed at the apex; lower leaves oblong or linear. . . . . . **Lance-leaved Tickseed.** (*Coreopsis lanceolata.*)

b. Plants not completely as in *a*....................................20.

20 *a*. Basal leaves round-ovate, heart-shaped at base.
Golden Ragwort. (*Senecio aureus.*)

b. Basal leaves tapering at the base into a winged petiole.................21.

21 *a*. Basal leaves obovate or oblanceolate, rounded at the apex.
Squaw-weed. (*Senecio obovatus.*)

b. Basal leaves usually oblong, rarely oblanceolate, not noticeably rounded at apex..................**Balsam Groundsel.** (*Senecio Balsamitae.*)

22 *a*. Flowers irregular..23.

b. Flowers regular..29.

23 *a*. Leaves compound; leaflets 6–10, with tendrils.
Vetchling. (*Lathyrus ochroleucus.*)

b. Leaves not completely as in *a*.................................24.

24 *a*. Flowers in a terminal spike or raceme............................25.

b. Flowers solitary on axillary stalks.............................27.

25 *a*. Leaves entire.....................**Chaff-seed.** (*Schwalbea americana.*)

b. Leaves lobed or compound..26.

26 *a*. Leaves pinnately parted or lobed...**Wood Betony.** (*Pedicularis canadensis.*)

b. Leaves doubly compound, the leaflets linear.
Corydalis. (*Capnoides flavulum.*)

27 *a*. Leaves opposite, linear-lanceolate to ovate.
Cow-wheat. (*Melampyrum lineare.*)

b. Leaves alternate, broadly ovate to heart-shaped.....................28.

28 *a*. Plants hairy; stipules ovate.....**Hairy Yellow Violet.** (*Viola pubescens.*)

b. Plants not hairy; stipules lanceolate.
Smooth Yellow Violet. (*Viola scabriuscula.*)

29 *a*. Plant without green leaves or green stem.
Squawroot. (*Conopholis americana.*)

b. Plants with green stem and green leaves...........................30.

30 *a*. Plants growing floating in water................................31.

b. Plants not growing in water.....................................32.

31 *a*. Leaves rounded, 3 in. or more broad; flowers solitary on the stalk.
Yellow Pond Lily. (*Nymphaea advena.*)

b. Leaves ovate, 5 in. or more long; flowers numerous on a spike.
Golden Club. (*Orontium aquaticum.*)

32 *a*. Perianth 6-parted, not differentiated into green calyx and colored corolla; stamens 6; leaves entire...33.

b. Plants not completely as in *a*.................................36.

33 *a*. Flowers solitary on the flowering stalk; leaves usually mottled.
Yellow Adder's-tongue. (*Erythronium americanum.*)

b. Plants not completely as in *a*.................................34.

34 *a*. Leaves basal; flowers in umbels...**Yellow Clintonia.** (*Clintonia borealis.*)

b. Leaves not basal; flowers solitary or 2 together.....................35.

35 *a*. Leaves with the bases surrounding the stem.
Perfoliate Bellwort. (*Uvularia perfoliata.*)

b. Leaves sessile, not as in *a*..............**Bellwort.** (*Uvularia sessilifolia.*)

36 *a*. Sepals 4; petals 4; stamens 6....................................37.

b. Flowers not completely as in *a*.................................43.

37 *a*. Basal leaves with terminal lobe only 1 or 2 times larger than the lateral lobes........................**Yellow Water-cress.** (*Roripa palustris.*)
b. Basal leaves with terminal lobe several times larger than the lateral lobes. 38.
38 *a*. Flowers about $\frac{1}{4}$ in. broad, showy and densely clustered at top of spike; leaves dark green, often shining above, not hairy. **Yellow Rocket.** (*Barbarea Barbarea.*)
b. Plants not completely as in *a*..39.
39 *a*. Upper leaves with bases clasping the stem. **Ruta-baga.** (*Brassica campestris.*)
b. Upper leaves not as in *a*..40.
40 *a*. Flowers $\frac{1}{4}$ in. or less broad..41.
b. Flowers $\frac{1}{2}$–$\frac{3}{4}$ in. broad..42.
41 *a*. Pods $\frac{1}{2}$–1 in. long, appressed to the stem. **Hedge Mustard.** (*Sisymbrium officinale.*)
b. Pods 2–4 in. long, spreading from the stem. **Tumble Mustard.** (*Sisymbrium altissimum.*)
42 *a*. Plant only slightly hairy; mature pods 1–2 in. long. **Indian Mustard.** (*Brassica juncea.*)
b. Plant covered with stiff hairs; mature pods $\frac{1}{2}$–$\frac{3}{4}$ in. long. **Wild Mustard.** (*Brassica arvensis.*)
43 *a*. Ovary inferior..44.
b. Ovary superior..48.
44 *a*. Petals 4; flowers 1–2 in. broad............**Sundrop.** (*Kneiffia pumila.*)
b. Petals usually 5; flowers $\frac{1}{4}$ in. or less broad........................45.
45 *a*. Leaves simple, linear, arranged in whorls. **Yellow Bedstraw.** (*Galium verum.*)
b. Leaves not completely as in *a*..46.
46 *a*. Fruit or ovary conspicuously winged, not flattened. **Meadow Parsnip.** (*Thaspium barbinode.*)
b. Fruit not winged, somewhat flattened..47.
47 *a*. All leaves ternately compound; fruit oblong. **Golden Meadow Parsnip.** (*Zizia aurea.*)
b. Basal leaves round-heart-shaped; fruit oval...**Alexanders.** (*Zizia cordata.*)
48 *a*. When broken plants exude a yellow juice..**Celandine.** (*Chelidonium majus.*)
b. Plants not completely as in *a*..49.
49 *a*. Stamens 15 or more..50.
b. Stamens 10 or less..66.
50 *a*. Perianth not differentiated into green calyx and colored corolla. **Marsh Marigold.** (*Caltha palustris.*)
b. Perianth differentiated into a green calyx and colored corolla.........51.
51 *a*. Pistils 1–6..52.
b. Pistils 10 or more..53.
52 *a*. Leaves compound, mostly basal. **Barren Strawberry.** (*Waldsteinia fragarioides.*)
b. Leaves simple..................**Frostweed.** (*Helianthemum canadense.*)
53 *a*. Calyx with distinct sepals which are readily detached................54.
b. Calyx more or less united at the base, the lobes not readily detached..61.

54 *a.* Flowers about ¼ in. broad; petals usually no longer than the sepals....55.
b. Flowers ½ in. or more broad; petals longer than the sepals.............57.
55 *a.* Head of fruit oblong or cylindric; plant stout.
Ditch Crowfoot. (*Ranunculus scleratus.*)
b. Head of fruit globose.......................................56.
56 *a.* Basal leaves lobed; achenes with recurved beak.
Hooked Crowfoot. (*Ranunculus recurvatus.*)
b. Basal leaves round-heart-shaped, achenes not as in *a.*
Kidney-leaved Crowfoot. (*Ranunculus abortivus.*)
57 *a.* Plant creeping; leaves often spotted.
Creeping Buttercup. (*Ranunculus repens.*)
b. Plants more or less erect.......................................58.
58 *a.* Basal leaves 3-7-divided, the divisions not stalked; plant 2-3 ft. high.
Meadow Buttercup. (*Ranunculus acris.*)
b. Basal leaves 3-divided; some of the divisions stalked.................59.
59 *a.* Lateral and terminal divisions of leaf stalked; plants only slightly hairy.
Swamp Buttercup. (*Ranunculus septentrionalis.*)
b. Only terminal division of leaf stalked; plants hairy.................60.
60 *a.* Plant with a bulbous root...**Bulbous Buttercup.** (*Ranunculus bulbosus.*)
b. Plant with fibrous roots.......**Hispid Buttercup.** (*Ranunculus hispidus*).
61 *a.* Leaves pinnately divided; flowers ¼ in. or less broad.
Spring Avens. (*Geum vernum.*)
b. Leaves palmately divided.......................................62.
62 *a.* Plants erect; leaflets 3, 1-3 in. long.
Rough Cinquefoil. (*Potentilla monspeliensis.*)
b. Plants prostrate or ascending.......................................63.
63 *a.* Leaflets 3......................**Indian Strawberry.** (*Duchesnea indica.*)
b. Leaflets usually 5 or more, or a few leaves with 3..................64.
64 *a.* Flowers in clusters; leaflets with silvery hairs beneath.
Silvery Cinquefoil. (*Potentilla argentea.*)
b. Flowers solitary on a stalk; leaflets not completely as in *a*...........65.
65 *a.* Plant 3-10 in. long; first flower from axil of first stem leaf.
Dwarf Five-finger. (*Potentilla pumila.*)
b. Plant ½-2 ft. long; first flower from axil of second to fourth stem leaf.
Five-finger. (*Potentilla canadensis.*)
66 *a.* Leaves compound with 5 obovate or inversely heart-shaped leaflets..67.
b. Leaves not completely as in *a*.......................................70.
67 *a.* Plant more or less erect, branched above; stalks of flowers erect or spreading.
Tall Yellow Wood-sorrel. (*Oxalis cymosa.*)
b. Plants more or less prostrate, branched at the base; stalks of fruit usually reflexed.......................................68.
68 *a.* Flowers ¼-½ in. broad; capsule ½-¾ in. long, tapering to apex.
Procumbent Wood-sorrel. (*Oxalis corniculata.*)
b. Flowers ½-¾ in. broad; capsule ½-1 in. long, short-pointed.............69.
69 *a.* Plants with appressed hairs........**Yellow Wood-sorrel.** (*Oxalis stricta.*)
b. Plants with loose, spreading hairs.
Slender Wood-sorrel. (*Oxalis Brittoniae.*)
70 *a.* Leaves opposite.........**Tufted Loose-strife.** (*Naumburgia thyrsiflora.*)
b. Leaves alternate.......................................71.

71 *a*. Style thread-like, longer than the corolla.
False Gromwell. (*Onosmodium virginianum.*)

b. Style not completely as in *a*.
Common Gromwell. (*Lithospermum officinalis.*)

FLOWERS GREENISH OR ELSE WITHOUT A DISTINCT PERIANTH.

72 *a*. Flowers green or greenish, or without a distinct perianth............73.
b. Flowers not as in *a*..116.
73 *a*. Leaves grass-like, linear, usually $\frac{1}{4}$ in. or less broad, 1 in. or more long...74.
b. Leaves not completely as in *a*..................................82.
74 *a*. Flowers in spikes...75.
b. Flowers in terminal panicles or umbels..........................77.
75 *a*. Spikes about $\frac{1}{4}$ in. long, solitary at the end of the flowering stalk.
Spike Rush. (*Eleocharis tenuis.*)
b. Spikes not completely as in *a*..................................76.
76 *a*. Spikes 1–3 in. long, somewhat flattened, the spikelets stalked; leaves fragrant when drying.......**Sweet Vernal Grass.** (*Anthoxanthum odoratum.*)
b. Spikes not completely as in *a*.........................**Sedge.** (*Carex.*)
77 *a*. Leaves hairy; flowers in terminal umbels.
Wood Rush. (*Juncoides campestre.*)
b. Leaves not hairy...78.
78 *a*. Flowers in top-shaped heads arranged in terminal umbels.
Rush. (*Juncus acuminatus.*)
b. Flowers not in top-shaped heads, arranged in panicles.................79.
79 *a*. Spikelets with hair-like awns about $\frac{1}{2}$ in. long.
Downy Broom-grass. (*Bromus tectorum.*)
b. Spikelets of panicle not completely as in *a*........................80.
80 *a*. Outer scale of spikelets shining; grass fragrant.
Holy Grass. (*Savastana odorata.*)
b. Outer scales of spikelet not shining; grasses not fragrant.............81.
81 *a*. Spikelet 1-flowered, comparatively broad, blunt at apex.
Mountain Rice. (*Oryzopsis asperifolia.*)
b. Spikelet 2–6-flowered, tapering to apex; grass common in lawns.
Spear-grass. (*Poa annua.*)
82 *a*. Flowers arranged compactly on a spike-like spadix which is surrounded or subtended by a leaf-like bract or spathe.......................83.
b. Flowers not arranged completely as in *a*...........................86.
83 *a*. Plants with a disagreeable, skunk-like odor; bract-like spathe often streaked.
Skunk Cabbage. (*Spathyema foetida.*)
b. Plants not with a disagreeable odor..............................84.
84 *a*. Leaves compound, with 3 leaflets; plant common in woods.
Jack-in-the-Pulpit. (*Arisaema triphyllum.*)
b. Leaves simple...85.
85 *a*. Leaves arrow-shaped; leaf-like spathe green, surrounding the flowers.
Arrow Arum. (*Peltandra virginica.*)
b. Leaves ovate; leaf-like spathe white, subtending the flowers.
Water Arum. (*Calla palustris.*)

86 *a*. Flowers in a compact spike which appears lateral on a flattened flowering stalk; leaves sword-shaped........... **Sweet Flag.** (*Acorus Calamus.*)
b. Plants not completely as in *a*.................................87.
87 *a*. Leaves in 1 or 2 whorls on an upright stem; leaves 1–4 in. long, ovate to lanceolate; styles very conspicuous.
Indian Cucumber-root. (*Medeola virginiana.*)
b. Plants not completely as in *a*.................................88.
88 *a*. Flowers arranged in globose heads $\frac{1}{2}$ in. or more in diameter; leaves linear, usually 1 ft. or more long......... **Bur-reed.** (*Sparganium eurycarpum.*)
b. Plants not completely as in *a*.................................89.
89 *a*. Leaves all basal; flowers in a terminal spike.........................90.
b. Plants not completely as in *a*.................................93.
90 *a*. Leaves linear, usually 3-ribbed.... **Bracted Plantain.** (*Plantago aristata.*)
b. Leaves oblong, lanceolate, or ovate.............................91.
91 *a*. Leaves ovate, often with rounded bases.
Common Plantain. (*Plantago Rugelii.*)
b. Leaves lanceolate, oblong, or sometimes obovate..................92.
92 *a*. Plant very hairy throughout; leaves obovate to oblong.
Dwarf Plantain. (*Plantago virginica.*)
b. Plants only slightly hairy; leaves narrowly oblong-lanceolate; plant common.
Rib-grass. (*Plantago lanceolata.*)
93 *a*. Leaves hollow or tubular, pitcher-like, with a terminal lid; plant grows in bogs........................ **Pitcher Plant.** (*Sarracenia purpurea.*)
b. Plants not completely as in *a*.................................94.
94 *a*. Plants prostrate on the ground.................................95.
b. Plants more or less erect.......................................96.
95 *a*. Leaves ovate or rounded, short-stalked; anthers orange-red; plant in wet places................ **Water Carpet.** (*Chrysosplenium americanum.*)
b. Leaves awl-shaped, not stalked; plant in dry soil.
German Knot-grass. (*Scleranthus annuus.*)
96 *a*. Flowers $\frac{1}{2}$–$\frac{3}{4}$ in. broad, irregular, arranged in racemes; leaves basal.
Fen Orchis. (*Leptorchis Loeselii.*)
b. Plants not completely as in *a*.................................97.
97 *a*. When cut or broken plants exude a milky juice....................98.
b. Plants without a milky juice....................................101.
98 *a*. Leaves 2–4 in. long, 1–3 in. broad; flowers in umbels.
Blunt-leaved Milkweed. (*Asclepias amplexicaulis.*)
b. Plants not completely as in *a*.................................99.
99 *a*. Leaves linear, numerous....... **Cypress Spurge.** (*Euphorbia Cyparissias.*)
b. Leaves not linear...100.
100 *a*. Leaves oblong to ovate, toothed, oblique at base.
Spotted Spurge. (*Euphorbia nutans.*)
b. Leaves ovate to rounded, entire, not oblique at base.
Wild Ipecac. (*Euphorbia Ipecacuanhae.*)
101 *a*. Leaves compound, the leaflets sometimes stalked.................102.
b. Leaves simple...106.
102 *a*. Leaves palmately compound; leaflets 3–11, 1–4 in. long............103.
b. Leaves not completely as in *a*.................................104.

103 *a*. Flowers 1–4 in. broad.........**Green Hellebore.** (*Helleborus viridis.*)
b. Flowers $\frac{1}{4}$ in. or less broad....**Black Snake-root.** (*Sanicula marylandica.*)
104 *a*. Leaflets 2–4 in. long, toothed...**Wild Sarsaparilla.** (*Aralia nudicaulis.*)
b. Leaflets $\frac{1}{2}$–2 in. long, somewhat lobed at apex......................105.
105 *a*. Flowers perfect; sepals 6; petals 6; stamens 6.
Blue Cohosh. (*Caulophyllum thalictroides.*)
b. Flowers imperfect; perianth 4 or 5 parted; stamens numerous.
Early Meadow Rue. (*Thalictrum dioicum.*)
106 *a*. Leaves mostly basal, 4–10 in. long, oblanceolate; flowers arranged in a panicle................**Swamp Saxifrage.** (*Saxifraga pennsylvanica.*)
b. Plants not completely as in *a*..................................107.
107 *a*. Leaves with toothed, lobed, or wavy margins......................108.
b. Leaves with entire margins...110.
108 *a*. Leaves rounded, with 7–9 rounded lobes.
Alum Root. (*Heuchera americana.*)
b. Leaves not rounded...109.
109 *a*. Basal leaves with two basal, spreading lobes.
Field Sorrel. (*Rumex Acetosella.*)
b. Basal leaves not lobed...........**Swamp Dock.** (*Rumex verticillatus.*)
110 *a*. Leaves ovate, 3–12 in. long, not all basal; flowers $\frac{1}{2}$–1 in. broad, the perianth 6-parted......................**White Hellebore.** (*Veratrum viride.*)
b. Plants not completely as in *a*..................................111.
111 *a*. Leaf-like branches narrowly linear, 1 in. or less long; flowers about $\frac{1}{4}$ in. long, perianth 6-parted...........**Asparagus.** (*Asparagus officinalis.*)
b. Plants not completely as in *a*..................................112.
112 *a*. Leaves 3–4, all basal, 4–8 in. long; flowers $\frac{1}{2}$–1 in. long.
Clintonia. (*Clintonia borealis.*)
b. Plants not completely as in *a*..................................113.
113 *a*. Plants with tendrils; flowers with bad odor.
Carrion Flower. (*Smilax herbacea.*)
b. Plants not with tendrils...114.
114 *a*. Flowers $\frac{3}{4}$ in. or more long; leaves 1–3 in. long.
Bellwort. (*Uvularia sessilifolia.*)
b. Flowers $\frac{1}{4}$–$\frac{3}{4}$ in. long; leaves 2–6 in. long.........................115.
115 *a*. Leaves hairy beneath, especially on the veins; flowers $\frac{1}{4}$–$\frac{1}{2}$ in. long.
Hairy Solomon's Seal. (*Salomonia biflora.*)
b. Leaves not hairy beneath; flowers $\frac{1}{2}$–$\frac{3}{4}$ in. long.
Smooth Solomon's Seal. (*Salomonia commutata.*)

Flowers neither yellow nor green.

116 *a*. Several small flowers collected into a dense head which is subtended by an involucre of bracts, as in the Daisy, not as in Clover..........117.
b. Flowers not arranged completely as in *a*........................134.
117 *a*. At least the outer flowers of the head with an irregular or strap-shaped corolla..118.
b. None of the flowers in the head with a strap-shaped corolla..........124.
118 *a*. Leaves pinnately divided into linear or lanceolate segments.
Corn Camomile. (*Anthemis arvensis.*)
b. Leaves not completely as in *a*...................................119.

119 *a*. Leaves all basal, plant usually cultivated.
Garden Daisy. (*Bellis perennis.*)
b. Leaves not all basal..120.

120 *a*. Heads 1–2 in. broad, ray flowers white; leaves often pinnatifid.
White Daisy. (*Chrysanthemum Leucanthemum.*)
b. Plants not completely as in *a*..121.

121 *a*. Heads 1–2 in. broad, ray flowers violet or purplish; stem not usually branched above..............**Robin's Plantain.** (*Erigeron pulchellus.*)
b. Heads usually ½–1 in. broad; stem usually branched above...........122.

122 *a*. Ray flowers rose-purple, 100 or more to each head.
Philadelphia Fleabane. (*Erigeron philadelphicus.*)
b. Ray flowers white or purple tinged, 70 or less to each head...........123.

123 *a*. Stem leaves with toothed margins...**Sweet Scabious.** (*Erigeron annuus.*)
b. Stem leaves with entire margins.....**Daisy Fleabane.** (*Erigeron ramosus.*)

124 *a*. Leaves with spiny-toothed margins.
Blessed Thistle. (*Cnicus benedictus.*)
b. Leaves not with spiny-toothed margins..........................125.

125 *a*. Leaves all basal, or wanting at flowering time; flowers pink to purple; heads small, in dense racemes.............**Butter-bur.** (*Petasites Petasites.*)
b. Plants not completely as in *a*..126.

126 *a*. Leaves not white-woolly beneath; plant 1–4 ft. high.
Daisy Fleabane. (*Erigeron ramosus.*)
b. Leaves white-woolly beneath..127.

127 *a*. Bracts of the involucre yellow.............**Cudweed.** (*Gifola germanica.*)
b. Bracts of the involucre not yellow..128.

128 *a*. No conspicuous basal leaves present.
Purple Cudweed. (*Gnaphalium purpureum.*)
b. Both basal and stem leaves present; flowers whitish.................129.

129 *a*. Basal leaves ¼–¾ in. broad, distinctly 1-nerved.....................130.
b. Basal leaves ½–2 in. broad, distinctly 3–5-nerved.....................132.

130 *a*. Basal leaves ¾–1 in. long, ovate; stolons leafy throughout.
Small Cat's-foot. (*Antennaria neodioica.*)
b. Basal leaves 1–3 in. long, oblanceolate..131.

131 *a*. Stolons leafy only toward the tips.
Field Cat's-foot. (*Antennaria neglecta.*)
b. Stolons leafy throughout...**Canadian Cat's-foot.** (*Antennaria canadensis.*)

132 *a*. Plant with purplish, glandular hairs; young leaves usually not hairy above.
Parlin's Cat's-foot. (*Antennaria Parlinii.*)
b. Plant not with glandular hairs; young leaves hairy above..............133.

133 *a*. Basal leaves 1–3 in. long, with petioles usually shorter than the blades.
Plantain-leaved Everlasting. (*Antennaria plantaginifolia.*)
b. Basal leaves 2–5 in. long, with petioles as long as the blade.
Tall Cat's-foot. (*Antennaria fallax.*)

134 *a*. Flowers small, arranged compactly on a spike-like spadix which is surrounded or subtended by a leaf-like bract or spathe..............135.
b. Flowers not arranged completely as in *a*..........................136.

135 *a*. Plant with a disagreeable, skunk-like odor; spathe encloses the spadix.
Skunk Cabbage. (*Spathyema foetida.*)

b. Plants not with a disagreeable odor; spathe only subtending the spadix. **Water Arum.** (*Calla palustris.*)

136 *a.* Plant with no part green, parasitic.............................137.

b. Plant with green stem and green leaves..........................138.

137 *a.* Plant whitish; flowers solitary..........**Cancer-root.** (*Thalesia uniflora.*)

b. Plant light-brown; flowers several..**Squaw-root.** (*Conopholis americana.*)

138 *a.* Flowers irregular (*i. e.*, with one petal different from the others)......139.

b. Flowers regular..200.

139 *a.* Ovary inferior; leaves with entire margins.........................140.

b. Ovary superior..142.

140 *a.* Flowers with a large, inflated, pink lip 1 in. or more long; leaves 2, basal. **Moccasin-flower.** (*Cypripedium acaule.*)

b. Flowers rose-purple, not completely as in *a*.........................141.

141 *a.* Leaves ovate, 2–5 in. long; flowers 3–6 together. **Showy Orchis.** (*Galeorchis spectabilis.*)

b. Leaves linear, 3–6 in. long; flowers usually solitary. **Arethusa.** (*Arethusa bulbosa.*)

142 *a.* Flowers with the petals not united into a tube......................143.

b. Flowers with the corolla or colored parts of perianth more or less tubular. 177.

143 *a.* Leaves compound..144.

b. Leaves simple..157.

144 *a.* Leaves palmately compound; leaflets 7–11...**Lupine.** (*Lupinus perennis.*)

b. Leaves pinnately compound, or with 3 leaflets.......................145.

145 *a.* Leaves tendril-bearing at the ends..................................146.

b. Leaves not tendril-bearing at the ends...............................151.

146 *a.* Some stipules ½ in. or more long, sharply toothed only at the base.....147.

b. Stipules usually less than ½ in. long, or toothed all around...........150.

147 *a.* Flowers yellow-white................**Vetchling.** (*Lathyrus ochroleucus.*)

b. Flowers purplish..148.

148 *a.* Stipules 1–2 in. long, nearly as large as the leaflets. **Beach Pea.** (*Lathyrus maritimus.*)

b. Stipules ½–1 in. long, not more than half as long as leaflets...........149.

149 *a.* Stem winged; leaflets lanceolate to linear. **Marsh Vetchling.** (*Lathyrus palustris.*)

b. Stem not winged; leaflets oval to oblong. **Marsh Pea.** (*Lathyrus myrtifolius.*)

150 *a.* Flowers whitish; stipules linear to lanceolate. **Carolina Vetch.** (*Vicia caroliniana.*)

b. Flowers purplish; stipules triangular-ovate. **American Vetch.** (*Vicia americana.*)

151 *a.* Leaves doubly compound; flowers in racemes. **Pink Corydalis.** (*Capnoides sempervirens.*)

b. Leaves compound with 3 leaflets; flowers in heads.................. 152.

152 *a.* Flowers crimson; head oblong, 1–3 in. long. **Crimson Clover.** (*Trifolium incarnatum.*)

b. Flowers red, pink, or white.......................................153.

153 *a.* Heads oblong, very silky, grayish; plant hairy; flowers whitish. **Rabbit-foot Clover.** (*Trifolium arvense.*)

b. Heads ovoid to globose, not grayish..............................154.

154 *a.* Heads ovoid; flowers red to purple; plant somewhat hairy............155.

b. Heads globose; flowers pink to white; plants not hairy..................156.

155 *a.* Leaflets usually spotted near the middle; leaflets finely toothed.

Red Clover. (*Trifolium pratense.*)

b. Leaflets not spotted; leaflets entire.

Mammoth Clover. (*Trifolium medium.*)

156 *a.* Flowers pink to white; plant not rooting at the nodes.

Alsike Clover. (*Trifolium hybridum.*)

b. Flowers white; plant rooting at the nodes.

White Clover. (*Trifolium repens.*)

157 *a.* Plant 5 ft. or more long, twining.

Dutchman's Pipe. (*Aristolochia macrophylla.*)

b. Plant less than 5 ft. long, not twining..............................158.

158 *a.* Flowers without a spur on the petals; leaves clustered near the summit of the stem..................**Fringed Milkwort.** (*Polygala paucifolia.*)

b. Flowers with 1 petal spurred or sac-like..........................159.

159 *a.* Lower petal somewhat sac-like; flowers about ¼ in. long.

Green Violet. (*Cubelium concolor.*)

b. Lower petal spurred; flowers more than ¼ in. long..................160.

BLUE AND WHITE VIOLETS.

160 *a.* Leaves all basal..161.

b. Leaves not all basal; flower-stalks from axils of leaves............173.

161 *a.* Part or all of leaves deeply lobed or cleft, not merely incised at the base..162.

b. Leaves not deeply lobed or cleft, sometimes incised at the base.......164.

162 *a.* Plant hairy; lobes of leaves toothed or cleft.

Early Blue Violet. (*Viola palmata.*)

b. Plants not noticeably hairy; lobes of leaves linear....................163.

163 *a.* Some petals with coarse hairs on inside.

Coast Violet. (*Viola Brittoniana.*)

b. Petals not with hairs on inside.......**Bird's-foot Violet.** (*Viola pedata.*)

164 *a.* Flowers white with purple veins......................................165.

b. Flowers some shade of blue or violet.................................167.

165 *a.* Leaves broadly heart-shaped or rounded; flowers fragrant.

Sweet White Violet. (*Viola blanda.*)

b. Leaves not as in *a*; flowers not fragrant............................166.

166 *a.* Leaves ovate to oblong.....**Primrose-leaved Violet.** (*Viola primulaefolia.*)

b. Leaves lanceolate.............**Lance-leaved Violet.** (*Viola lanceolata.*)

167 *a.* Flowers fragrant; stolons present.........**English Violet.** (*Viola odorata.*)

b. Flowers not fragrant; stolons not present............................168.

168 *a.* Leaves heart-shaped, often broader than long, not incised at base.....169.

b. Leaves lanceolate to ovate or arrow-shaped, often incised at the base...172.

169 *a.* Leaves narrowly heart-shaped; base of blade spreading at right angles to the petiole; white base of flower conspicuous.

Thin-leaved Wood Violet. (*Viola obliqua.*)

b. Leaves heart-shaped to ovate; base of blade somewhat folded or hood-shaped...170.

170 *a*. Plants growing in wet places and swamps; flowers often darker toward the whiter base.................. **Marsh Blue Violet.** (*Viola cucullata.*)
b. Plants growing in moist woods and meadows, not in swamps..........171.
171 *a*. Flowers deep violet-purple; stalks of flower usually 2 in. or less long.
Early Blue Violet. (*Viola palmata.*)
b. Flowers violet, not purplish; stalks of flowers 2 in. or more long.
Meadow Blue Violet. (*Viola papilionacea.*)
172 *a*. Plant hairy; leaves rather ovate... **Ovate-leaved Violet.** (*Viola fimbriatula.*)
b. Plant not hairy; leaves lanceolate to arrow-shaped.
Arrow-leaved Violet. (*Viola sagittata.*)
173 *a*. Flowers usually 1 in. or more broad; plant escaped from cultivation.
Heart's-ease. (*Viola tricolor.*)
b. Flowers less than 1 in. broad..................................174.
174 *a*. Flowers blue or violet; spur elongated.............................175.
b. Flowers whitish or faintly tinged with violet on the outside...........176.
175 *a*. Spur about ½ in. long, as long as the petal.
Long-spurred Violet. (*Viola rostrata.*)
b. Spur about ¼ in. long, half as long as the petal.
American Dog Violet. (*Viola conspersa.*)
176 *a*. Stipules entire.................... **Canadian Violet.** (*Viola canadensis.*)
b. Stipules toothed........................ **Striped Violet.** (*Viola striata.*)
177 *a*. Corolla with a spur at the base... **Blue Toadflax.** (*Linaria canadensis.*)
b. Corolla not with a spur at the base..............................178.
178 *a*. All of stem leaves alternate...179.
b. Some or all of stem leaves opposite or in whorls....................181.
179 *a*. Bracts subtending the flowers scarlet, very conspicuous.
Scarlet Painted-cup. (*Castilleja coccinea.*)
b. Bracts subtending the flowers not scarlet.........................180.
180 *a*. Leaves pinnately lobed or divided.
Wood Betony. (*Pedicularis canadensis.*)
b. Leaves not pinnately lobed nor divided.
Chaff-seed. (*Schwalbea americana.*)
181. *a*. Leaves in a whorl near the summit of the stem.
Fringed Milkwort. (*Polygala paucifolia.*)
b. Leaves opposite, rarely in whorls................................182.
182 *a*. Calyx with a protuberance on the upper side.
Skullcap. (*Scutellaria pilosa.*)
b. Calyx not with a protuberance on the upper side...................183.
183 *a*. Flowers solitary or few together in the axils, not in racemes..........184.
b. Flowers not arranged as in *a*.....................................191.
184 *a*. Flowers ¼–1 in. long, usually longer than broad....................185.
b. Flowers less than ¼ in. long, usually as broad as long...............189.
185 *a*. Plants creeping, with rounded or ovate-heart-shaped leaves.........186.
b. Plants erect or ascending, leaves not rounded.....................187.
186 *a*. Upper lip of corolla 2-lobed or notched; calyx about 15-nerved.
Ground Ivy. (*Glecoma hederacea.*)
b. Upper lip of corolla entire; calyx 5-nerved.
Henbit. (*Lamium amplexicaule.*)

187 *a.* Calyx 4-toothed; stamens 4..........**Cow-wheat.** (*Melampyrum lineare.*)
b. Calyx 5-lobed or 5-parted; stamens 2..............................188.
188 *a.* Flowers whitish; calyx subtended by 2 bractlets.
Hedge Hyssop. (*Gratiola virginiana.*)
b. Flowers purplish; calyx not subtended by 2 bractlets.
False Pimpernel. (*Ilysanthes attenuata.*)
189 *a.* Plant densely hairy; leaves ovate, bluntly toothed or entire.
Corn Speedwell. (*Veronica arvensis.*)
b. Plant not densely hairy; leaves oblong to linear, sometimes ovate.....190.
190 *a.* Flowers pale blue, arranged raceme-like in the axils of the leaves.
Thyme-leaved Speedwell. (*Veronica serpyllifolia.*)
b. Flowers white...............**Purslane Speedwell.** (*Veronica peregrina.*)
191 *a.* Conspicuous, ovate, entire, overlapping bracts subtend each 1–3 flowers; spike 1–3 in. long....................**Self-heal.** (*Prunella vulgaris.*)
b. Bracts subtending the flowers not completely as in *a*.................192.
192 *a.* Flowers $\frac{3}{4}$–1 in. long..193.
b. Flowers $\frac{1}{2}$ in. or less long.......................................194.
193 *a.* Stamens 2, the connective elongated and hinged to the filament.
Lyre-leaved Sage. (*Salvia lyrata.*)
b. Stamens 4, not hinged as in *a*......**Beard-tongue.** (*Pentstemon hirsutus.*)
194 *a.* Stamens 4; flowers in panicles....**Hare Figwort.** (*Scrophularia leporella.*)
b. Stamens 2; flowers in spikes or racemes..........................195.
195 *a.* Flowers $\frac{1}{4}$–$\frac{1}{2}$ in. long, in dense, long-stalked spikes.
Water Willow. (*Dianthera americana.*)
b. Flowers $\frac{1}{4}$ in. or less long.......................................196.
196 *a.* Racemes terminal; leaves $\frac{1}{4}$–$\frac{1}{2}$ in. long.
Thyme-leaved Speedwell. (*Veronica serpyllifolia.*)
b. Racemes axillary; leaves $\frac{1}{2}$–4 in. long..........................197.
197 *a.* Racemes densely flowered, spike-like; plant 3–10 in. long.
Common Speedwell. (*Veronica officinalis.*)
b. Racemes loosely flowered; plant $\frac{1}{2}$–3 ft. long.........................198.
198 *a.* Leaves linear to linear-lanceolate.
Marsh Speedwell. (*Veronica scutellata.*)
b. Leaves broadly ovate to lanceolate..............................199.
199 *a.* Stem leaves sessile......**Water Speedwell.** (*Veronica Anagallis-aquatica.*)
b. Stem leaves petioled........**American Brooklime.** (*Veronica americana.*)
200 *a.* Leaves linear, thick, with an onion-like odor.
Meadow Garlic. (*Allium canadense.*)
b. Leaves not with onion-like odor..................................201.
201 *a.* Plants growing submerged in water; leaves linear, $\frac{3}{4}$ in. or less long.
Ditch Moss. (*Philotria canadensis.*)
b. Plants not growing submerged in water..........................202.
202 *a.* Perianth parts 3 or 6, not joined into a tube; stamens 3 or 6.........203.
b. Flowers not completely as in *a*.................................217.
203 *a.* Ovary inferior; flowers usually blue.............................204.
b. Ovary superior...207.
204 *a.* Flowers $\frac{3}{4}$ in. or less broad...205.
b. Flowers 1 in. or more broad.....................................206.

205 *a.* Leaves about $\frac{1}{8}$ in. broad, about $\frac{1}{2}$ the height of the stem.
Pointed Blue-eyed Grass. (*Sisyrinchium angustifolium.*)
b. Leaves about $\frac{1}{4}$ in. broad, nearly as high as the stem.
Blue-eyed Grass. (*Sisyrinchium graminoides.*)
206 *a.* Leaves $\frac{1}{4}$–$\frac{1}{2}$ in. broad; outer perianth parts 1–2 in. long.
Slender Blue Flag. (*Iris prismatica.*)
b. Leaves $\frac{1}{2}$ in. or more broad; outer perianth parts 2–3 in. long.
Large Blue Flag. (*Iris versicolor.*)
207 *a.* Flowers blue, purplish, or rose-colored........................208.
b. Flowers not colored as in *a*........................209.
208 *a.* Flowers 1–2 in. broad, subtended by leaf-like bracts.
Spiderwort. (*Tradescantia virginiana.*)
b. Flowers $\frac{1}{4}$–$\frac{1}{2}$ in. broad...............**Twisted-stalk.** (*Streptopus roseus.*)
209 *a.* Flowers about $\frac{1}{4}$ in. or less broad........................210.
b. Flowers $\frac{1}{2}$ in. or more broad........................213.
210 *a.* Both basal and stem leaves present; flowers in wand-like racemes.
Blazing-star. (*Chamaelirium luteum.*)
b. Only stem leaves present........................211.
211 *a.* Plant with tendrils, often with prickles......**Greenbrier.** (*Smilax glauca.*)
b. Plants not with tendrils........................212.
212 *a.* Leaves not clasping the stem; stamens longer than the perianth.
Wild Spikenard. (*Vagnera racemosa.*)
b. Leaves somewhat clasping the stem; stamens shorter than the perianth.
Star-flowered Spikenard. (*Vagnera stellata.*)
213 *a.* Leaves 3 in a terminal whorl........................214.
b. Leaves mostly basal........................216.
214 *a.* Flowers purple to pink, with offensive odor.
Ill-scented Wake-robin. (*Trillium erectum.*)
b. Flowers white to pink, not with offensive odor....................215.
215 *a.* Stalk of flower recurved, petals recurved, usually pink.
Nodding Wake-robin. (*Trillium cernuum.*)
b. Stalk of flower not recurved; petals usually white.
Large-flowered Wake-robin. (*Trillium grandiflorum.*)
216 *a.* Leaves lanceolate; flowers solitary.
White Adder's-tongue. (*Erythronium albidum.*)
b. Leaves linear, thick; flowers in umbels; outer side of perianth greenish.
Star-of-Bethlehem. (*Ornithogalum umbellatum.*)
217 *a.* When cut or broken plants exude a white milky sap................218.
b. When cut or broken plants do not exude a milky sap................221.
218 *a.* Flowers with 5 petal-like hoods inside and alternate with the petals...219.
b. Flowers not completely in as *a*........................220.
219 *a.* Some leaves in whorls of 4; flowers whitish.
Four-leaved Milkweed. (*Asclepias quadrifolia.*)
b. Leaves all opposite; flowers purplish.
Blunt-leaved Milkweed. (*Asclepias amplexicaulis.*)
220 *a.* Leaves 1–2 in. long, oblong to ovate.
Flowering Spurge. (*Euphorbia corollata.*)
b. Leaves 1–5 in. long, linear to lanceolate.
Myrtle Spurge. (*Euphorbia Lathyrus.*)

221 *a.* Petals or colored parts of the perianth joined into a tube at least at the base. . . . . 222.
b. Petals or perianth parts distinct, not joined into a tube. . . . . 263.
222 *a.* Perianth 6-lobed; leaves basal, linear, thick; flowers blue.
Grape Hyacinth. (*Muscari botryoides.*)
b. Plants not completely as in *a*. . . . . 223.
223 *a.* Leaves clustered in a single whorl at the top of the stem; flowers white.
Star-flower. (*Trientalis americana.*)
b. Leaves not clustered as in *a*. . . . . 224.
224 *a.* Leaves all basal, with 3 leaflets. . . . . **Buckbean.** (*Menyanthes trifoliata.*)
b. Leaves not all basal. . . . . 225.
225 *a.* Leaves opposite or in whorls on the stem. . . . . 226.
b. All leaves alternate. . . . . 241.
226 *a.* Flowers solitary or 2 together in the axils of the leaves. . . . . 227.
b. Flowers not arranged completely as in *a*. . . . . 233.
227 *a.* Flowers 2 together in the axils, their ovaries united; leaves thick.
Partridge Berry. (*Mitchella repens.*)
b. Plants not completely as in *a*. . . . . 228.
228 *a.* Leaves rounded; flowers purplish close to the ground; roots spicy.
Wild Ginger. (*Asarum reflexum.*)
b. Plants not completely as in *a*. . . . . 229.
229 *a.* Ovary inferior. . . . . 230.
b. Ovary superior. . . . . 231.
230 *a.* Flowers violet or blue; plant 1 ft. high or less.
Bluets. (*Houstonia coerulea.*)
b. Flowers purplish-brown; plant 2 ft. or more high.
Horse Gentian. (*Triosteum aurantiacum.*)
231 *a.* Flowers with perianth lobes fringed. . . . . **Mitrewort.** (*Mitella diphylla.*)
b. Flowers with perianth lobes not fringed. . . . . 232.
232 *a.* Flowers $\frac{3}{4}$ in. or more broad, usually blue; leaves thick, evergreen.
Myrtle. (*Vinca minor.*)
b. Flowers about $\frac{1}{4}$ in. broad, scarlet or white; leaves not evergreen.
Pimpernel. (*Anagallis arvensis.*)
233 *a.* Ovary inferior. . . . . 234.
b. Ovary superior. . . . . 239.
234 *a.* Leaves opposite. . . . . **Long-leaved Houstonia.** (*Houstonia longifolia.*)
b. Leaves in whorls. . . . . 235.
235 *a.* Plants with rough or hairy stems. . . . . 236.
b. Plants with stems smooth, not hairy. . . . . 238.
236 *a.* Leaves 6–8 in a whorl, 1–3 in. long, oblanceolate or linear.
Cleavers. (*Galium Aparine.*)
b. Leaves not completely as in *a*. . . . . 237.
237 *a.* Fruit or ovary hairy; leaves $\frac{1}{2}$–2 in. long, oval to ovate-lanceolate.
Wild Liquorice. (*Galium circaezans.*)
b. Fruit or ovary not hairy; leaves $\frac{1}{4}$–$\frac{3}{4}$ in. long, linear to oblanceolate.
Clayton's Bedstraw. (*Galium Claytoni.*)
238 *a.* Leaves 6–8 in a whorl. . . . . **Wild Madder.** (*Galium Mollugo.*)
b. Leaves usually 4 in a whorl. . . . . . **Marsh Bedstraw.** (*Galium tinctorium.*)

239 *a*. Corolla tube much shorter than the lobes.
Marsh Pink. (*Sabbatia campanulata.*)
b. Corolla tube nearly as long as the lobes........................240.
240 *a*. Plant prostrate; leaves usually $\frac{1}{2}$ in. or less long; plant cultivated in gardens.
Ground Pink. (*Phlox subulata.*)
b. Plant erect; leaves 1–3 in. long..........**Downy Phlox.** (*Phlox pilosa.*)
241 *a*. Plant creeping, with rounded leaves; perianth 3-lobed, purplish; roots spicy.
Wild Ginger. (*Asarum reflexum.*)
b. Plants not completely as in *a*...............................242.
242 *a*. Ovary inferior; leaves rounded, with clasping bases; flowers blue.
Venus' Looking-glass. (*Specularia perfoliata.*)
b. Ovary superior..243.
243 *a*. Flowers about $\frac{1}{4}$ in. or less broad...............................244.
b. Flowers $\frac{1}{2}$ in. or more broad...................................255.
244 *a*. Leaves lobed or pinnately compound.
Water-leaf. (*Hydrophyllum virginicum.*)
b. Leaves with entire or wavy-toothed margins....................245.
245 *a*. Corolla tube closed by 5 scales attached opposite the corolla lobes.....246.
b. Corolla tube not completely as in *a*..............................248.
246 *a*. Basal leaves 2–4 in. long or wanting; nutlets erect or incurved.
Stickseed. (*Lappula Lappula.*)
b. Basal leaves 5–18 in. long; nutlets spreading.....................247.
247 *a*. Flowers reddish-purple to white.
Hound's-tongue. (*Cynoglossum officinale.*)
b. Flowers blue................**Wild Comfrey.** (*Cynoglossum virginicum.*)
248 *a*. Style thread-like, much longer than the corolla; corolla lobes erect.
False Gromwell. (*Onosmodium virginianum.*)
b. Styles not completely as in *a*; corolla lobes spreading...............249.
249 *a*. Flowers in racemes..250.
b. Flowers in umbels or panicles.................................254.
250 *a*. Racemes with numerous leafy bracts; flowers white or yellowish.....251.
b. Racemes not with numerous leafy bracts; flowers blue or white.......252.
251 *a*. Corolla without scales in the tube; mature nutlets brown, rough.
Corn Gromwell. (*Lithospermum arvense.*)
b. Corolla with scales in the tube; mature nutlets white, smooth.
Common Gromwell. (*Lithospermum officinale.*)
252 *a*. Flowers white; calyx with hooked hairs.
Early Scorpion-grass. (*Myosotis virginica.*)
b. Flowers blue; calyx not with hooked hairs......................253.
253 *a*. Calyx lobes much shorter than the calyx tube; plants cultivated and escaped.
Forget-me-not. (*Myosotis palustris.*)
b. Calyx lobes as long as the calyx tube; plants not cultivated.
Small Forget-me-not. (*Myosotis laxa.*)
254 *a*. Flowers in panicles; perianth differentiated into calyx and corolla.
Water Pimpernel. (*Samolus floribundus.*)
b. Flowers in umbels; perianth not differentiated.
Bastard Toadflax. (*Comandra umbellata.*)
255 *a*. Leaves pinnately compound....................................256.
b. Leaves not pinnately compound................................257.

256 *a*. Flowers in panicles; stamens alternate with the corolla lobes.
Jacob's Ladder. (*Polemonium Van Bruntiae.*)
b. Flowers not completely as in *a*......... **Bittersweet.** (*Solanum Dulcamara.*)
257 *a*. Climbing or trailing vines...258.
b. Erect herbs..260.
258 *a*. Flowers about ½ in. broad, with 2 greenish spots at the base of each corolla lobe......................... **Bittersweet.** (*Solanum Dulcamara.*)
b. Flowers 1 in. or more broad...259.
259 *a*. Leaves heart-shaped at the base; stigma globose.
Wild Potato Vine. (*Ipomoea pandurata.*)
b. Leaves not heart-shaped at the base; stigma 2-lobed.
Upright Bindweed. (*Convolvulus spithamaeus.*)
260 *a*. Flowers 3–4 in. long, funnel-shaped, usually violet.
Purple Thorn Apple. (*Datura Tatula.*)
b. Flowers 2 in. or less long..261.
261 *a*. Corolla lobes spreading at right angles to the corolla tube, salver-shaped.
Blue Phlox. (*Phlox divaricata.*)
b. Corolla more or less funnel-shaped...262.
262 *a*. Flowers about 1 in. long, blue........... **Bluebells.** (*Mertensia virginica.*)
b. Flowers ½ in. or less long, reddish-purple or white.
Hound's-tongue. (*Cynoglossum officinale.*)
263 *a*. Two or more petals with a spur at the base.................................264.
b. None of the petals with a spur at the base.................................265.
264 *a*. Five spurs to each flower; flowers reddish.
Wild Columbine. (*Aquilegia canadensis.*)
b. Two spurs to each flower; flowers whitish.
Dutchman's Breeches. (*Bicuculla Cucullaria.*)
265 *a*. Leaves simple, with entire or toothed margins, not lobed...........266.
b. Leaves compound, dissected, or lobed.......................................291.
266 *a*. Some or all of the leaves opposite or in whorls on the stem...........267.
b. All leaves alternate or basal..277.
267 *a*. Leaves in a single whorl beneath the single white flower.
Rue Anemone. (*Syndesmon thalictroides.*)
b. Plants not completely as in *a*..268.
268 *a*. Flowers with 2 sepals; leaves usually 2, linear; plants common.
Spring Beauty. (*Claytonia virginica.*)
b. Plants not completely as in *a*..269.
269 *a*. Calyx tubular with 4 or more lobes or teeth; flowers pink.
Wild Pink. (*Silene caroliniana.*)
b. Calyx with separate sepals, or sepals wanting...............................270.
270 *a*. Petals 5, deeply notched, appearing like 10...............................271.
b. Petals 5, not deeply notched...273.
271 *a*. Leaves ovate; styles 3............. **Common Chickweed.** (*Alsine media.*)
b. Leaves oblong to linear; styles 5..272.
272 *a*. Stem with sticky hairs; leaves oblong.
Mouse-ear Chickweed. (*Cerastium vulgatum.*)
b. Stem not with sticky hairs; leaves linear.
Field Chickweed. (*Cerastium arvense.*)

273 *a*. Stamens of the same number as the sepals.
Pearlwort. (*Sagina procumbens.*)
b. Stamens twice as many as the sepals....................274.
274 *a*. Leaves about $\frac{1}{4}$ in. long, awl-shaped to ovate....................275.
b. Leaves $\frac{1}{2}$ in. or more long....................276.
275 *a*. Leaves ovate; flowers about $\frac{1}{8}$ in. broad.
Thyme-leaved Sandwort. (*Arenaria serpyllifolia.*)
b. Leaves awl-shaped; flowers about $\frac{1}{2}$ in. broad.
Pine-barren Sandwort. (*Arenaria caroliniana.*)
276 *a*. Leaves 1–4 in. long, all basal; plant common.
Early Saxifrage. (*Saxifraga virginiensis.*)
b. Leaves $\frac{1}{2}$–1 in. long, oval to oblong....**Sandwort.** (*Moehringia lateriflora.*)
277 *a*. Flowers white; perianth not differentiated; leaves 2 or 3.
False Lily-of-the-Valley. (*Unifolium canadense.*)
b. Plants not completely as in *a*....................278.
278 *a*. Petals 4; sepals 4; stamens usually 6....................279.
b. Petals 5 or more....................287.
279 *a*. Pods or ovaries usually less than twice as long as broad....................280.
b. Pods or ovaries elongated, usually more than twice as long as broad...281.
280 *a*. Flowers purple, about $\frac{3}{4}$ in. broad.........**Honesty.** (*Lunaria annua.*)
b. Flowers white, $\frac{1}{2}$ in. or less broad...**Horse-radish.** (*Roripa Armoracia.*)
281 *a*. Flowers $\frac{3}{4}$–1 in. broad, purple or white, fragrant.
Dame's Violet. (*Hesperis matronalis.*)
b. Flowers $\frac{1}{2}$ in. or less broad....................282.
282 *a*. Basal leaves usually rounded.......**Bulbous Cress.** (*Cardamine bulbosa.*)
b. Basal leaves not rounded....................283.
283 *a*. Plant usually 1 ft. or more high; stem leaves present....................284.
b. Plant 1 ft. or less high; stem leaves usually wanting....................286.
284 *a*. Stem leaves not with clasping bases...**Sickle-pod.** (*Arabis canadensis.*)
b. Stem leaves with clasping bases....................285.
285 *a*. Basal leaves 1–2 in. long; pods erect..**Hairy Rock-cress.** (*Arabis hirsuta.*)
b. Basal leaves 2–4 in. long; pods recurved.
Smooth Rock-cress. (*Arabis laevigata.*)
286 *a*. Basal leaves 1–2 in. long...**Mouse-ear Cress.** (*Stenophragma Thaliana.*)
b. Basal leaves 1 in. or less long.............**Whitlow-grass.** (*Draba verna.*)
287 *a*. Leaves thick and fleshy.............**Wild Stonecrop.** (*Sedum ternatum.*)
b. Leaves not as in *a*....................288.
288 *a*. Leaves round-heart-shaped....................289.
b. Leaves obovate to oval....................290.
289 *a*. Plant prostrate; flowers $\frac{1}{4}$–$\frac{1}{2}$ in. broad.
Common Mallow. (*Malva rotundifolia.*)
b. Plant erect; flowers 1–2 in. broad....**High Mallow.** (*Malva sylvestris.*)
290 *a*. Leaves all basal...............**Early Saxifrage.** (*Saxifraga virginiensis.*)
b. Leaves not all basal................**Pimpernel.** (*Samolus floribundus.*)
291 *a*. Ovary inferior; flowers in umbels; petals 5; stamens 5.............292.
b. Ovary superior; flowers not completely as in *a*....................296.
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Ground-nut. (*Panax trifolium.*)
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293 *a.* Ovary covered with coarse hairs or bristles........................294.
b. Ovary either smooth or covered with very fine hairs...............295.
294 *a.* Ovary ovoid, covered with hooked bristles.
Snake-root. (*Sanicula marylandica.*)
b. Ovary linear, covered with coarse hairs.
Sweet Cicely. (*Washingtonia Claytoni.*)
295 *a.* Leaves finely dissected into linear segments....**Caraway.** (*Carum Carui.*)
b. Leaflets ovate, not dissected.....**Chervil.** (*Chaerophyllum procumbens.*)
296 *a.* When broken plants exude a reddish sap; flowers white.
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297 *a.* Perianth not differentiated into green calyx and colored corolla.......298.
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Field Sorrel. (*Rumex Acetosella.*)
b. Flowers not completely as in *a*..................................299.
299 *a.* Flowers about 2 in. broad, white, borne singly in the axils of the 2 umbrella-like leaves......................**Mandrake.** (*Podophyllum peltatum.*)
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b. Flowers solitary on elongated stalks..............................303.
303 *a.* Leaflets rounded or oblong, somewhat 3-lobed.
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310 *a.* Stem leaves usually entire or slightly tolthed.......................311.
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311 *a.* Basal leaves 1–2 in. long.......**Lyre-leaved Rock Cress.** (*Arabis lyrata.*)
b. Basal leaves 3–7 in. long..............**Sickle-pod.** (*Arabis canadensis.*)

312 *a.* Segments of leaves usually oval or obovate; pods spreading.
Wood Bitter-cress. (*Cardamine flexuosa.*)
b. Segments of leaves usually oblong or linear; pods erect or ascending...313.
313 *a.* Plant branched, about 1 ft. or more high.
Pennsylvania Bitter-cress. (*Cardamine pennsylvanica.*)
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Small-flowered Bitter-cress. (*Cardamine parviflora.*)
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Wood Sorrel. (*Oxalis Acetosella.*)
b. Leaves not completely as in *a*.....................................318.
318 *a.* Flowers 1 in. or more broad, pale purple.
Wild Crane's-bill. (*Geranium maculatum.*)
b. Flowers $\frac{1}{2}$ in. or less broad.......................................319.
319 *a.* Flowers pale-pink to whitish, in compact clusters.
Carolina Crane's-bill. (*Geranium carolinianum.*)
b. Flowers purplish, not in compact clusters..........................320.
320 *a.* Flowers about $\frac{1}{2}$ in. broad.......**Herb Robert.** (*Geranium Robertianum.*)
b. Flowers about $\frac{1}{4}$ in. broad.
Small-flowered Crane's-bill. (*Geranium pusillum.*)
321 *a.* Leaves 3-lobed, all basal, sometimes wanting; flowers with 3 sepal-like bracts.............................**Hepatica.** (*Hepatica Hepatica.*)
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322 *a.* Leaves with 3 leaflets; flowers white..............................323.
b. Leaves not with 3 leaflets...325.
323 *a.* Pistils 5.....................**Indian Physic.** (*Porteranthus trifoliatus.*)
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324 *a.* Plant growing in the woods; flowering stalk usually longer than the leaves.
Wood Strawberry. (*Fragaria americana.*)
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325 *a.* Leaves with 5–9 rounded lobes......................................326.
b. Leaves compound with several leaflets..............................327.
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False Mitrewort. (*Tiarella cordifolia.*)
b. Leaves not mainly basal; flowers purplish.
High Mallow. (*Malva sylvestris.*)
327 *a.* Flowers purple, $\frac{3}{4}$–1 in. broad............**Purple Avens.** (*Geum rivale.*)
b. Flowers cream-colored, $\frac{1}{4}$–$\frac{1}{2}$ in. broad.
Cream-colored Avens. (*Geum flavum.*)

PROCEEDINGS OF THE CLUB

October 10, 1911*

The meeting of October 10, 1911, was held at American Museum of Natural History at 8:15 p.m., President Rusby presiding. Forty persons were present.

The minutes of the meetings of May 8 and May 31 were read and approved. Professor R. A. Harper, Columbia University, Dr. C. W. Ballard, 115 W. 68th Street, F. D. Fromme, Columbia University, A. B. Stout, New York Botanical Garden; and Miss C. Rabinowitz, New York City, were then proposed for membership.

The report of the secretary on the method of changing the day of a regular meeting was accepted. Dr. E. B. Southwick, chairman of the Field Committee reported progress. A similar report was offered by Dr. Rusby, acting for the committee to revise the constitution.

Professor R. A. Harper, Dr. C. W. Ballard, F. D. Fromme, A. B. Stout, and Miss C. Rabinowitz were elected to membership.

The scientific program consisted of a lecture on "Some Edible and Poisonous Mushrooms," by Dr. W. A. Murrill. The lecture was illustrated with lantern slides which had been made from photographs of specimens recently collected in the vicinity of New York City and colored while the specimens were in a fresh condition, thus enabling the artists to reproduce the natural coloration of the specimens photographed. The speaker stated that the exceptionally large number of recent deaths due to poisonous species of mushrooms was no doubt attributable to the abundant crops of *Amanita phalloides* and *Amanita muscaria* which have followed the copious rainfall of this season. Slides showing the poisonous species in several stages of growth were exhibited and the special marks of identification were pointed out. Following these were shown slides of some of the edible mushrooms easily confused with the poisonous varieties. The two most characteristic features of the poisonous mushroom are the "death

* Inadvertently omitted from the January issue of Torreya.

cup" or volva, and the "ring" or annulus. The careless mushroom hunter may pull up a specimen leaving the volva still buried in the earth, or the annulus, which is a more or less fragile structure, may have already disappeared and serious consequences result from the oversight.

Dr. Murrill wished to emphasize the fact that there were no rules or tests that could be applied with certainty. It is necessary that one gathering mushrooms for eating purposes should confine his operations to such species as he knows intimately in all their various forms.

The lecture was discussed by Dr. H. H. Rusby, Dr. Thomas, E. B. Southwick, and E. C. Edwards.

Meeting adjourned.

B. O. Dodge,
Secretary

December 12, 1911

The meeting of December 12, 1911, was called to order by President Rusby at 8:15 p.m. Sixty-one persons were present. The minutes of November 14 were read and approved.

Dr. Rusby in a few remarks announced the death of Sir Joseph Hooker and an obituary notice from the *Evening Post* was read by Dr. E. B. Southwick.

The announced scientific program consisted of a lecture on "Methods of Detecting Adulterations in Foods and Drugs," by Dr. H. H. Rusby.

The lecturer stated that the methods of detecting adulterants in foods and drugs were physical and chemical. To the chemical matters he would merely make brief reference. They depend upon the well-known fact that the medicinal and nutritive values of drugs and foods, respectively, were due to certain of their constituents. The fact that these constituents are present in more or less definite percentages, enables the authorities to establish standard requirements as to these percentages. Such percentage may be lowered by the removal of part of the active constituent, or by the addition of foreign material. In either case, the article is adulterated, in the legal sense. Chemical methods of examination are based upon the determinations of such percentages, by the extraction of the constituents in question and their subsequent identification.

In many cases an adulterant may be added in such small amount that it will not reduce the percentage of active constituent below the standard. In other cases, as to drugs, the active constituent is not known, or is not amenable to chemical determination, and for these and other reasons, the detection of adulterants by chemical methods is often impracticable, or even impossible. In many such cases, detection is possible by physical methods. In the lecturer's opinion, the number of cases in which physical methods could determine quality while chemical methods could not, was much greater than the number of those in which the conditions were reversed. Hence, the great importance of microscopical analysis, a method that is yet in its infancy.

The method of physical examination most generally useful is that of ordinary examination, by sight, touch, smell, fracture, etc., on the part of an experienced examiner, perfectly familiar with the articles, but very often, especially in the case of finely powdered substances, these methods would wholly fail. Then recourse must be had to the compound microscope. The anatomical elements of vegetable substances, however minute, are in most cases quite as distinctly characteristic as are the entire plant bodies to which they pertain, and all that is necessary is to magnify their appearance by the aid of the compound microscope.

Numerous lantern slide illustrations were employed to show the distinctive elements in various drugs and their principal adulterants, these pertaining to trichomes, epidermis, fibers, stone-cells, crystals, and starch-grains.

Meeting adjourned.

B. O. Dodge,
Secretary

January 9, 1912

The first meeting of the Club for 1912 was held at the American Museum of Natural History at 8:15 p.m. Vice-President Barnhart presided. Twenty-two persons were present.

This being the annual meeting, reports were presented by the various officers.

The report of the Treasurer was presented and upon motion referred to an Auditing Committee.

The Secretary reported that fourteen meetings had been held during the year with a total attendance of 363, and an average attendance of 26. Nine persons have been elected to membership, and eight resignations have been received and accepted. Seven illustrated lectures were delivered during the season, at which the combined attendance was 262.

The editor reported that the BULLETIN for the year 1911 contains 570 pages and 35 plates, and that the expense of its publication was slightly in excess of the amount allowed for it by the Budget Committee.

The editor of TORREYA presented a special report for that periodical.

The chairman of the Field Committee reported that twenty-five meetings were advertised during the year. The total number that took advantage of the field trips was 74. The recommendations contained in this report were adopted.

As chairman of the Local Flora Committee, Dr. N. L. Britton gave a brief report of the investigations carried on by Mr. Norman Taylor on the local flora. The work of Mr. Taylor will soon be ready for publication.

Dr. W. A. Murrill, chairman of the Committee on Cryptogamic Flora, reported that considerable progress had been made in the collection and study of local material. Many colored illustrations of the fleshy fungi from New York City, Long Island, and Massachusetts have been prepared for publication and public exhibition.

The report of the Program Committee was read and placed on file.

Dr. W. Mansfield, delegate to the council of the New York Academy of Sciences, reported that a sum of money had been set aside to be used in defraying the expenses of lectures held under the auspices of the affiliated societies. A motion was carried to apply to the Council for twenty-five dollars to pay the expenses of Dr. F. Shreve, who will lecture before the Club February 13.

The resignations of Mrs. Ruth Price Cohn, Mrs. J. N. Trainer, Misses Fanny Julien, Caroline Dana, and Catherine Murray were read and accepted. Dr. W. D. Johnston and Dr. W. Marquette, of Columbia University, Professor L. S. Hopkins, of Peabody High School, Pittsburgh, Dr. G. Bovard, University of Southern California, Los Angeles, and Miss Ellen Shaw, of New York City, were elected to membership in the Club.

The election of officers for the year 1912 resulted as follows:

President, Edward S. Burgess.

Vice-Presidents, John Hendley Barnhart and Herbert Maule Richards.

Secretary and Treasurer, Bernard O. Dodge.

Editor, Philip Dowell.

Associate Editors, John Hendley Barnhart, Jean Broadhurst, Ernest Dunbar Clark, Alexander William Evans, Robert Almer Harper, Marshall Avery Howe, Herbert Maule Richards and Norman Taylor.

Dr. W. Mansfield was elected Delegate to the Council of the New York Academy of Sciences.

The following committees were appointed by the President for the year 1912:

Finance Committee, John I. Kane and Robert A. Harper.

Program Committee, Elizabeth G. Britton, Fred J. Seaver, C. Stuart Gager and Jean Broadhurst.

Committee on Local Flora, N. L. Britton, Chairman; PHANEROGAMS, N. L. Britton, C. C. Curtis, E. P. Bicknell, K. K. Mackenzie, Norman Taylor and E. L. Morris; CRYPTOGAMS, W. A. Murrill, E. G. Britton, Tracy E. Hazen, M. A. Howe and Philip Dowell.

Budget Committee, H. H. Rusby, E. S. Burgess, M. A. Howe, J. H. Barnhart, B. O. Dodge, Philip Dowell and N. L. Britton. Meeting adjourned.

B. O. DODGE,
Secretary

NEWS ITEMS

We learn from the St. Louis *Globe-Democrat* (February 20) that the resignation of Dr. William Trelease, director of the Missouri Botanical Garden, has been accepted, with regret, by the board of trustees of that institution. Dr. Trelease gives as his reason for retirement, the necessity of greater leisure for research work. Since 1889, when he was appointed director of the Garden, at the suggestion of Asa Gray, Dr. Trelease has made the Missouri Botanical Garden one of the most important in the world. No successor has, as yet, been appointed.

Dr. H. C. Cowles, associate professor of ecology at the University of Chicago, has been elected second vice-president of the Chicago Academy of Sciences.

The London *Times* states that in the old parish church of St. Mary, Teddington, a tablet has recently been dedicated to the memory of the Rev. Stephen Hales, D.D., a former vicar of the parish and one of the most distinguished men of science of the eighteenth century. A number of eminent living *savants* have for a long time been endeavoring to discover his burial place, in order to preserve his memory, and at length the stone recording his death was found in the floor of the porch of the church with nearly the whole of the lettering obliterated. The new tablet has been placed on the wall of the west porch beneath the tower of the old church, and bears the following inscription:

"Beneath is the grave of Stephen Hales. The epitaph, now partly obliterated, but recovered from a record of 1795, is here inscribed by the piety of certain botanists, A.D. 1911. 'Here is interred the body of Stephen Hales, D.D., Clerk of the Closet to the Princess of Wales, who was minister of this parish 51 years. He died 14th January, 1761, in the 84th year of his age.'"

Mr. Francis Darwin has written for the current number of the *Parish Magazine* an interesting account of Dr. Hales, in the course of which he says: "Stephen Hales has been called the 'father of physiology,' and he deserves this title in regard both to animals and plants. His experiments on the blood pressure of animals are second only to Harvey's work on the circulation. In the domain of plant physiology he is equally great. He treated the manifestations of life as things to be weighed, measured and analyzed in the laboratory. It is this point of view that gives his work so modern a character and entitles him to be considered one of the founders of a rational science of biology. Although he loved science for its own sake, it is equally clear that he was dominated by a permanent desire to use his knowledge for the benefit of his fellow-creatures."

It is a pleasure to report that on Wednesday the twenty-eighth of February, at the one hundred and twenty-fifth anniversary of the University of Pittsburgh, the honorary degree of Doctor of Laws was conferred on Nathaniel Lord Britton.

A new botanical museum for the University of Christiania, Norway, is being erected and will be ready for occupancy in the autumn of 1913.

Dr. C. N. Jensen, fellow in plant pathology, Cornell University, has been appointed professor of botany and plant pathology in Utah Agricultural College and Experiment Station and entered on his duties on February 1.

We learn from *Science* that Professor F. O. Grover of Oberlin College "discovered several unknown plants and extended the known distribution of other species," during last summer's work at Monhegan Island, Maine. Near Moosehead Lake, *Carex crinita Portereii*, was collected for the first time since the early seventies.

According to the New York *Evening Post* (March 2) Miss Helen Ashurst Choate has been promoted from an assistant to instructor in botany at Smith College.

Dr. and Mrs. N. L. Britton, accompanied by Mr. J. F. Cowell of the Buffalo Botanic Garden, sailed for eastern Cuba, on March second, to continue botanical explorations in the vicinity of the Sierra Maestra.

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A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

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PHYTOGEOGRAPHY AND ITS RELATION TO TAXONOMY AND OTHER BRANCHES OF SCIENCE

By P. A. Rydberg

Phytogeography in this country is almost a neglected field. Until recently no attempt had been made to give an adequate account of the phytogeography of North America or any larger part thereof. The phytogeographical sketches extant are scattered through the botanical journals and a few books on systematic botany. No attempt had been made to bring these records together until Professor Harshberger's Phytogeographic Survey of North America* appeared last year. The writer admires Professor Harshberger's courage in undertaking such a stupendous work, when in reality so little was known of the phytogeography of this continent, and still less was published. In a voluminous work, as the one there presented, compilation is not only allowable, but legitimate and altogether necessary, for it is impossible for any one person to know the flora of the whole of North America. But how is it possible to compile, in cases where there is but little or nothing to compile from.

The writer has many times been thinking of writing a phytogeographical sketch of the Rocky Mountain region, in which he has spent six summers, besides one in the Black Hills of South Dakota and two in the foot-hill region of western Nebraska. One reason for not having done so has been the lack of time. Another reason has been that he knew that the sketch had to be writen practically from his personal knowledge of the region, for very few of the records are of any great help, without con-

* Die Vegetations der Erde, vol. XIII.

[No. 3, Vol. 12, of Torreya, comprising pp. 45–72, was issued 12 March 1912.]

siderable sifting and digesting. The third reason has been that he has not felt himself a good enough phytogeographer to undertake it. Furthermore, the sketches that are extant, dealing with the flora of the Rocky Mountains, are not writen by phytogeographers. Brandegee, Porter, Parry, Watson, Greene, A. Nelson, M. E. Jones, and myself were, or are, mainly taxonomists, Fremont an explorer, Tweedy a surveyor and botanical collector, Merriam a zoölogist, Leiberg, Ensign and Sudworth forestry men, Cockerell an entomologist and general scientist, Clements and Ramaley ecologists, etc. It was, therefore, by no means an easy task to give a phytogeographical sketch of the Rocky Mountain region. In the writer's opinion, Professor Harshberger has not succeeded very well in this respect, not even as well as might be expected. How he has succeeded in sketching the vegetation of other parts of our country, I can not tell, as I have too little knowledge thereof to venture to express any opinion. The main reason why he did not succeed so well, was because he had very little personal knowledge of the Rockies, but I think that it depended also upon the fact that our phytogeographers, and ecologists also, do not in general realize the importance of the relationship between phytogeography on one side and taxonomy and other branches of science on the other.

It is not necessary that a good phytogeographer should be a good phytographer—he need not have described a single species of plant; neither that he should be a good systematist—he need not have studied the systematic relationship of a single group of plants; but it is important that he should be a fairly good general taxonomist, so as to know the plants he is dealing with. When a person is, by circumstances, practically confined to compilation, it is still more important that he should know the species credited to a certain region, in order to be able to sift judiciously the records. In the list of trees and shrubs of the Black Hills are enumerated by Harshberger: *Chimaphila umbellata, Cornus canadensis* and *Linnaea borealis* (should have been *L. americana*). Either by ignorance or by carelessness these have been included among trees and shrubs. *Cornus canadensis* is less shrubby than our strawberries, for the rhizome, the only woody portion, is not so stout as that of the strawberry. Among the trees of the Rocky Mountains are enumerated *Pyrus sambucifolia*, an Asiatic species, *Cupressus guadalupensis*, a tree of Lower California, *Sapindus marginatus*, one from Florida, and *Prunus angustifolia*, the Chickasaw Plum, a tree of unknown origin, naturalized in eastern United States. On page 254, in the list of plants common to the Sierra Nevada, the Cascade Mountains, and the Rocky Mountains, are given among others: *Antennaria dioica* and *Arabis hirsuta*, two European plants. The only plant of the *A. dioica* group common to those regions is *A. rosea*, and the American representative of *Arabis hirsuta* is *A. ovata* Poir. Further are enumerated *Arnica Chamissonis*, a strictly boreal plant, and *Spraguea umbellata*, a plant confined to the Sierras and neighboring mountains, and represented in the Rockies by *S. multiceps* Howell. On page 249, *Spiraea betulifolia* is given as transcontinental. The species is Siberian. The only close relative it has on this continent is *S. Steveni*, an Alaskan species. *S. splendens* (=*S. arbuscula*) of California and Oregon, *S. lucida* aand *S. densiflora* of the Rockies and *S. corymbosa* of the Alleghenian region, all of which have been confused with *S. betulifolia*, have erect instead of reflexed sepals. Among the alpine plants of the Rockies are enumerated on page 192 *Smelowskia calycina*, a Siberian plant, on page 193 *Sausurea alpina* and on page 194 *Androsace Chamaejasme*, both European plants. These are represented in the Rocky Mountains by *Smelowskia americana* and *S. ovalis*, *Sausurea densa* and *S. remotifolia*, and *Androsace carinata*. On page 248 are enumerated among the immigrants from the *northwest* (Italics mine): *Alnus incana*, *Kalmia glauca*, and *Vaccinium Myrtillus*, all *northeastern* plants, represented in the Rockies by *Alnus tenuifolia*, *Kalmia microphylla*, and *Vaccinium oreophilum* and *V. scoparium*.

A good phytogeographer should not have made errors like these. It is not necessary that he should be a taxonomist of the "finely splitting kind," so that he, of his own accord, should see all those fine distinctions drawn by systematists nowadays, but he should keep up with the progress of taxonomy enough, so that he would not use determinations made by Tom, Dick, and

Harry, a half or a quarter of a century ago. It was very proper that Tweedy in 1885 and in 1886, should report, among the vegetation of the Geyser areas of the Yellowstone Park, such plants as *Chrysopsis villosa* (now known to belong to the plains of Kansas and Nebraska), *Gnaphalium Sprengelii* (a South American plant), *Panicum dichotomum* var. *pubescens*, *Castilleja minor*, *Hulsea nana* and *Botrychium ternatum* var. *australe*, for at that time the plants were known, although erroneously so, under those very names: but it is not proper now, after all the work done on the flora of the region by Tweedy, Aven Nelson, Elias Nelson, Dr. Mearns, Rose, Burglehouse, Ernst Bessey and myself, and others. A little attention paid to my Flora of Montana and the Yellowstone National Park and other more recent publications would have shown to anyone that these names meant *Chrysopsis depressa*, *Gnaphalium sulphurescens* or *G. lagopodioides*, *Panicum thermale*, *Spraguea multiceps*, *Castilleja exilis*, *Hulsea carnosa*, and *Botrychium Coulteri*. We are not surprised to see Parry in 1863 having reported for Colorado, *Papaver nudicaulis*, *Gentiana frigida* and *Pedicularis sudetica*, instead of *Papaver radicatum*, *Gentiana Romanzovii* and *Pedicularis scopulorum*. It is a little more surprising to see it done to-day (see page 565). The writer himself was perhaps excusable for enumerating among the plants of the Black Hills, in 1894 (the year when the manuscript was prepared, printed in 1896), such plants as *Neillia* (now *Opulaster*) *opulifolia* (an eastern species), *Synthyris rubra* (a northwestern plant), *Stachys aspera* (eastern), *Osmorrhiza nuda* (Californian), and *Mertensia sibirica* (Asiatic); but he would not be if he did it to-day.

A good phytogeographer should be fairly well acquainted with the nomenclature of the time. It matters little which school he follows. It would not do to simply accept and copy any name given in a certain report, without judicious sifting. If care is not taken, it may happen, as it has in Professor Harshberger's book, that the same plant may be under different names, even on the same page. On pages 192–4, we find for instance both *Alsine* (*Arenaria*) *verna* and *Arenaria* (*Alsinopsis*) *propinqua*, which, as far as the Rockies are concerned, represent the same plant; so also *Geum Rossii* and *Sieversia turbinata*, *Gentiana frigida* and *G. Romanzovii*. On page 532, we find both *Argemone alba* and *A. platyceras*. They both stand for *A. intermedia*, the only species found in Nebraska. *A. alba* is found in Florida and *A. platyceras* is mainly Mexican.

That the same plant appears under different names on different pages is a rather common occurrence in Harshberger's book. Only a few instances may be mentioned, as *Alnus incana*, on page 248, and *A. tenuifolia*, on 250; *Agropyron divergens*, on 561, and *A. spicatum*, on 516, 536, etc.; *Aristida purpurea*, on 527, 528, 530, and 532, and *A. longiseta*, on 537 and 582; *Betula occidentalis*, on 566, *B. microphylla*, on 570, and (*B. fontinalis*) in the index; *Cercocarpus betuloides*, on 266, *C. betulifolius*, on 269 (= *C. parvifolius* Nutt.) in the index, all representing *C. montanus* Raf. It is not quite as bad when he uses different generic names on different pages, as for instance *Neillia opulifolia*, on page 566, and *Physocarpus opulifolius*, on 249; *Carduus Pitcheri*, on 399, and *Cnicus* (*Cirsium*) *Pitcheri*, on 499. *Echinacea angustifolia*, on page 522, and *E. purpurea*, on 524, do not indicate in any way that they are congeneric with *Brauneria pallida*, on 518 and 527. A little hunting in the index would probably bring to light dozens of similar cases.

A good phytogeographer should be careful about using synonymy. Harshberger's book shows more than one case of bad synonymy. Only one such case of Rocky Mountain plants may be cited. On page 192 we find *Arenaria* (*Alsinopsis*) *Rossii* R. Br. (*A. stricta* Michx.). The synonym belongs to *A. Michauxii*, as is correctly given in the index. There are also some names in the book which as far as I know have never been published, as for instance *Lewisia brachycarpa* Engelm., on page 195, and *Sieversia grandiflora*, on 562. The former is probably a typographical error for *L. brachycalyx*, although Engelmann never had it in the genus *Lewisia*, but in *Calandrinia*. What *Sieversia grandiflora* stands for, I am at a loss to know.

A good phytogeographer must be a fairly good geographer. It is not so important that he should be well versed in political or commercial geography, but he must know the physiography of the region he is treating. He must not let the political boundaries mislead him to draw corresponding division lines between his phytogeographical provinces or districts. As far as the Rocky Mountains are concerned, Professor Harshberger has committed two serious errors in this way: (1) He has drawn the line between the northern Rockies and the southern Rockies to correspond to the international boundary between Canada and the United States. (2) He has, at least in one part of his book, included the whole of New Mexico and Arizona in the Rocky Mountain Region.

On page 546, Professor Harshbergher divides the Rocky Mountain Region into two districts: the Northern or Dominion District and the Southern or Park Mountain District, together with an eastern outlobe, the Black Hills Territory. Anyone who is well acquainted with the flora of the Rockies knows that nearly all the plants characteristic of the Canadian Rockies are also found in western Montana and northern Idaho. All the forest trees of the Canadian Rockies, the Gold Range and the Selkirks are also found, as far as I know, in the Bitter Root Mountains or in the Flathead and the Coeur d'Alene valleys. In fact, the northern Rocky Mountains, from a botanical standpoint, extend south to northern Wyoming, although many plants characteristic of the Selkirks and the Bitter Root Mountains are lacking. The Wind River Mountains may be regarded as the most southerly extension thereof. The southern Rockies, which may properly be called the Park Mountain District, do not extend farther north than to the Laramie Mountains of southern Wyoming. Between these and the Wind River Mountains is an opening, where the plains practically break through. Several of the forest trees of the southern Rockies are not found north of this break, as for instance, *Picea pungens*, *Abies concolor*, *Pinus aristata* and *P. edulis*, *Sabina monosperma* and rarely *S. utahensis*, nor any of the scrub-oaks. Of course *Larix occidentalis*, *L. Lyallii*, *Abies grandis*, *Tsuga heterophylla*, *T. Mertensiana*, *Picea albertiana*, *Pinus monticola*, *Thuja plicata*, *Sabina prostrata*, and *Taxus brevifolia* of the Canadian Rockies are not found in Colorado, but are found in western Montana and northern Idaho, and some of them extend into northern Wyoming.

In treating the coniferous forests formations of the southern or Park Mountain Region, Professor Harshberger mentions the following belts: (1) *Pinus ponderosa* belt, (2) *Pinus monticola* belt, (3) *Abies subalpina* belt. These three "belts" were evidently taken from Leiberg's Survey of the Coeur d'Alene Mountains. As stated before, this region belongs to the northern Rockies and fits poorly with the Park Region of Colorado. The low-land *Pinus ponderosa*, which gave the name to the first belt, is not found in Colorado. It is there represented by the up-land *Pinus scopulorum*, often regarded as a variety of *P. ponderosa*. *Pinus monticola* is lacking altogether. Regarding the *Abies subalpina* belt it may be remarked that Harshberger makes the following statement: "The *Abies subalpina* belt exists above 5,000 feet." This is true as far as the Coeur d'Alene region is concerned, but does it give a correct impression, when the Park Mountains of Colorado are considered? I doubt if it occurs here below 9,000 feet, and it does not form a belt, but grows scattered. In Colorado, *Picea Engelmannii*, not *Abies subalpina*, is the characteristic tree of the Subalpine zone. The three belts given above characterize better the Selkirks of the Dominion District than the Park Mountain District of southern Wyoming, Colorado, and northern New Mexico. Harshberger gives practically nothing definite concerning the zonal distribution of the trees of the latter district. The zones here are four and rather distinct. (1) The foot-hills or transition zone between the plains and the mountains proper. This could well be called the juniper or cedar belt. North of the Arkansas Divide, the characteristic woody plant is *Juniperus* or *Sabina scopulorum*, mixed with *Pinus scopulorum*, *Cercocarpus montanus*, *Rhus trilobata* and its relatives, etc. South of the Arkansas Divide the characteristic trees are *Juniperus* or *Sabina monosperma* and *Pinus edulis*. Above these is usually a belt of chaparrel consisting of scrub-oaks, service berries and skunk-brush. (2) The montane zone or pine belt, with *Pinus scopulorum*, *P. Murrayana*, *P. flexilis*, *Pseudotsuga mucronata*, *Abies concolor*, *Picea pungens*, etc., rather mixed. (3) The subalpine zone or spruce-aspen belt. On the northern cooler slopes *Picea Engelmannii* is predominant, but mixed with *P. pungens*, *Pseudotsuga*, and *Abies lasiocarpa* (*A. subalpina*). On richer soil, there are almost pure stands of aspen, *Populus tremuloides*. On southern drier exposed ridges near the timber line *Pinus aristata* is at home. (4) Alpine zone, above the timber line, with the woody vegetation represented by low shrubs only.

As stated above, Professor Harshberger has in one place included Arizona and New Mexico in the Rocky Mountain Region. I refer to pages 244–245, where he enumerates the trees of the Rockies. In this list which enumerates 63 species are included practically all the trees found in those two states.* In the list we find the following: *Juniperus californica*, *J. virginiana*, *J. pachyphloea*, *Cupressus guadalupensis*, *Pinus chihuahuana*, *P. arizonica*, *Populus monolifera* (*P. deltoides*), *Morus microphylla* (*M. rubra*), *Juglans californica*, *J. rupestris*, *Condalia obovata*, *Olneya tesota*, *Parkinsonia Torreyana*, *Prosopis pubescens*, *P. juliflora*, *Acasia Greggii*, *Platanus Wrightii*, *Chilopsis saligna* (should have been *C. linearis*), *Arbutus Menziesii*, *Cereus giganteus*, *Sapindus marginatus*, *Prunus angustifolia*, *Pyrus sambucifolia*. Of these *Juglans californica*, *Juniperus californica* and *Arbutus Menziesii* are Pacific Coast species; *Cupressus guadalupensis*, *Sapindus marginatus*, *Prunus angustifolia* and *Pyrus* [now *Sorbus*] *sambucifolia*, I have discussed before. For *Populus monolifera* and *Juniperus virginiana*, eastern trees, should be substituted *P. Sargentii* and *J. scopulorum*. All the rest enumerated above belong either to the desert regions of Arizona and New Mexico or else to what Harshberger, on his map, has marked Western Sierra Madre. Rightly he extends this Mexi-

*Some time after writing this article, I happened to read Gray and Hooker's article on the Vegetation of the Rocky Mountains, and found that Harshberger's list is practically taken from that paper, he having omitted two species, added seven, and rearranged the order. Gray and Hooker acknowledged that they had compiled the list from Sargent's report in the 10th United States Census. Much of what is here said of Harshberger's list, applies as well to that of Gray and Hooker, and shows what errors even the best botanists may commit in compiling without sifting. The only differences between their standpoint and that of Harshberger is that in their article they treated of the whole continental divide, and Harshberger had already limited the Rocky Mountain Region before giving the list, and that their article was published over 30 years ago.

can region into Arizona. Professor Harshberger introduces his list with the following remarks (see page 244): "The mere botanical enumeration of the following species of trees gives no proper idea of the arboreal flora of the region." Certainly, as the list is made up, it does not. *Abies grandis*, common in the northwest, *Sabina monosperma*, in the south, *Populus acuminata*, *P. Wilslezeni*, *Alnus tenuifolia*, *Acer glabrum*, the two species of *Tsuga*, several of *Salix* and *Betula*, etc., are omitted. Further down, he remarks: "From the whole region oaks are conspicuously absent as trees." *Quercus macrocarpa* (found, however, only in the Black Hills) and *Q. leptophylla* are always trees; *Q. utahensis*, *Q. Gambellii*, *Q. neomexicana* and *Q. subtomentosa* are sometimes trees 20 to 30 feet high.

A good phytogeographer should carefully consider the geographical distribution of the different species; (1) not cite them from a region where they do not grow; (2) carefully consider to which regions or zone they really belong and to what extent they have invaded other districts; (3) whether they are the characteristic or primary species of a certain zone or are only incidentally found there. Many data can be had from printed reports, but as noted above many of the reports are very unreliable and most of them need verification. A good deal of personal field work is imperative, but if such is impossible or unfeasible, the same result can practically be gained by studying the collections in our greater herbaria. If Professor Harshberger had studied a little more the herbaria at the University of Pennsylvania and the Philadelphia Academy of Sciences, which are easily accessible to him, I think that many misrepresentations of the geography of individual plants could have been avoided. I shall mention only a few from the Rocky Mountain Region. On pages 246–7 is given a list of 26 *woody plants* from *California* [Italics are mine], which enter the northwest of the Rockies and extend "only as far as the Bitterroot Mountains in Idaho." In this list are included *Pinus albicaulis*, which is not really a *Californian* tree and is found in Montana east as well as west of the divide and also on the Yellowstone Plateau; *Artemisia discolor* var. *incompta* and *A. ludoviciana*, which are by no means woody and the latter of the two originally described from Kansas and not found in California; *Rhamnus Purshiana,* which extends into southern Utah; *Rubus leucodermis,* extending to the northern part of the same state; and *Spiraea arbuscula,* wholly Californian and Oregonian. Among the "northeastern and eastern element" entering the region "southward to Idaho and Montana" are erroneously enumerated the following: *Abies balsamea, Picea alba* [*P. canadensis*], and *P. Mariana* are not found in the Rockies, reaching the foothills of the same only in the upper valleys of Piece and Liard rivers in Alberta. The specimens of *P. alba* or *canadensis* reported from southern Alberta, British Columbia and Montana, and seen by the writer, all belong to *P. albertiana* S. Brown. *Ulmus americana* and *Quercus macrocarpa* have been found in the region only in the Black Hills; and *Bryanthes* [*Phyllodoce*] *empetriformis* is a western not an eastern species.

On page 248 it is stated that the Southern Rocky Mountain Region is clearly distinct from the Northern Region "by the injection of floral elements derived from Mexico and the Great Basin." A list of 16 species follows. Of these *Acer glabrum* is endemic to the Rockies. *Berberis repens, Juniperus scopulorum, Clematis ligusticifolia* and *Lonicera ciliosa* are just as common in the northern as in the southern Rockies. *Artemisia dracunculoides* is eastern, but found in both. *Rosa nutkana* and *Gaulteria myrsinites* are northern, the former not found at all and the latter rarely in the southern Rockies. None of them belong to Mexico and only a few of them are found in the Basin. *Tetradymia glabrata,* enumerated among those that have entered from the northwest, belongs to the Great Basin. On page 249 is given a list of a small element "confined to the Central Mountains." In this list is included *Fraxinus anomala,* a canyon plant, not found in the mountains proper and barely reaching the region from the southwest. In the list of plants ranging from Colorado northward is enumerated *Ceanotus ovatus,* a species of the plains and prairies, extending into the region only in Colorado and the Black Hills, and *Salix irrorata,* confined to the Southern Rockies.

In the list of Great Basin plants, on page 250, are enumerated *Ceanotus velutinus* and *Physocarpus Torreyi,* both typical Rocky

Mountain Plants, which however are found also in the Basin Mountains. Among the trees and shrubs which had their "origin in Mexico" we find *Artemisia tridentata*, *Purshia tridentata* and *Cercocarpus ledifolius*, all Basin plants and not found in Mexico, except the first; and *Tetradymia canescens* which belongs to the Columbia plains. In the list of plants common to Sierra Nevada and the Cascade Mountains, on page 254, we find *Lonicera involucrata*, a plant common in the Rockies and extending northeast to the Hudson Bay. On page 249, it is given as transcontinental. *Luzula spicata* and *Potentilla procumbens* are said to be common to the Sierras and the Rockies "only." They are both circumpolar arctic-alpine plants.

A good illustration of carelessness in referring plants to a wrong life zone, is given on pages 192–194, where Professor Harshberger lists the alpine plants. That a plant occasionally grows at a certain high altitude, or that it is found incidentally above what seems to be the timber line, does not make it an alpine plant. In the list are found the following, which usually grow on treeless hills or ridges, but still can not be called alpine: *Arabis canescens*, *Vesicaria* [*Lesquerella*] *alpina*, *Homalobus tenuifolius*, *Balsamorrhiza incana*, *B. Hookeri*, *Tanacetum capitataum*, *T. Nuttallii*, *Tetradymia inermis*, and *Pentstemon secundiflorus*. The following grow on dry plains and foothills: *Solidago nana*, *Stenotus acaulis*, and *Pentstemon humilis*. The following wood-plants are included: *Mitella pentandra*, *M. trifida*, *Lonicera coerulea*, *Linnaea borealis* (should have been *L. americana*), and *Arnica fulgens*. *Erigeron Coulteri* and *Senecio triangularis* grow on subalpine creek banks, *Lithophragma tenella* on wet hillsides, *Arnica longifolia* and *Dodecatheon pauciflorum* in wet meadows far below the alpine zone; so also *Primula mistassinica*, which is not found in the Rockies at all, but belongs to the Hudson Bay region and the northeast. These plants, erroneously given as alpine, constitute one sixth of the list.

A good phytogeographer should differentiate between different formations due to moisture, to exposure to sun, rain, and wind, to altitude, to improper drainage, but these factors are almost wholly neglected in the treatment of the Rocky Mountains. I have already pointed out the different belts or zones due to altitude in the southern Rockies, not alluded to by Harshberger. The grass lands of the Rockies he dismisses with half a page, on 561, and does not differentiate the various grass-covered areas, as for instance the lowland meadows with their practically eastern grass-flora, the table-lands with a flora similar to that of the Great Plains, the bench lands and alkali flats with their predominantly endemic species, the dry grass covered ridges, the grassy mountain slopes, covered mostly by species of *Festuca*, the mountain tops and alpine meadows, all with their characteristic grass flora. Such things are simply omitted.

A good phytogeographer should also be somewhat of a geologist. As the writer makes no claim of being such, he has omitted discussion of Professor Harshberger's geological treatment.

A good phytogeographer should also be a fair bibliographer and historian. The publications on the Rocky Mountain botany by M. E. Jones, Miss Eastwood, Blankinship and G. E. Osterhout seem to have escaped Harshberger's notice. Jones, especially, has published a good deal of taxonomic work with phytogeographical notes, and also a short but good phytogeographic sketch well worth reading.

Professor Harshberger's part on floristic work is divided in several sections, of which the fifth treats of the Prairies, Arid Plains, and Rocky Mountains. Although the first part of this section does not treat of the Rocky Mountains, I was induced to read the same. As none of the reviewers of the book has called the attention to an incongruity in this part, I may do so here. It is surprising to find that the list of botanical explorers of the Prairies and Great Plains is headed by John and William Bartram, Peter Kalm, Michaux, father and son, and Pursh. None of these early explorers, except Michaux the younger, were west of the Alleghanian Region and the eastern part of the Region of the Great Lakes. Michaux the younger, went west as far as Ohio and Tennessee, perhaps to the Mississippi River. On the map at the end of the volume, the Prairie and Great Plain Region extends from Illinois to the Rockies, and Harshberger himself in the text, on page 519, limits the eastern boundary to central

Illinois. Of course, there are isolated small prairies east thereof, perhaps as far east as western New York, but I think that all these early botanists should be excluded from the list of the explorers of the Prairie Region. They belong to the Northeast.

Of course there are many good features in Professor Harshberger's Phytogeographic Survey, as for instance his bibliographies, which will be very useful to students of phytogeography; but these good features I have omitted, for they do not bear upon my subject. This article is not intended to be, as it may seem, merely an adverse criticism of Professor Harshberger's work under a disguised title. There is something more aimed at. Not long ago, all botanical work done in this country was taxonomic work, usually known as systematic botany, although much had indeed little of "systematic" in it. Now it is different. Courses in taxonomy are almost excluded from the curriculum of many of our colleges and universities, or if not excluded, so little esteemed that students are discouraged from entering upon them. The taxonomist, whether a systematic botanist in the true sense or a phytographer, is looked upon by phytogeographers, ecologists, physiologists, cytologists, and morphologists as of a lower grade of stuff;—as if it took a less fine grain of brain to make a first class systematist than any other kind of -ist. What I have aimed to show is that the taxonomist has his place in Botany, and if his work is ignored, other -ists, who are dependent upon him, can not do good work. Professor Harshberger's Phytogeographical Survey, in a field fairly well known to me, gave me an opportunity to show to what such ignoring would lead.

New York Botanical Garden.

PISTILLODY IN ARGEMONE PLATYCERAS LINK AND OTTO.

By I. M. Lewis

The occurrence of pistillody or the conversion of stamens into pistils is by no means common, neither is it rare. It has been reported in many genera of plants and has been repeatedly

FIG. 1. A teratological specimen of *Argemone platyceras*.

described by various investigators. The different types of this anomaly are too well-known to require discussion.* The teratological specimen of *Argemone platyceras* shown in the accompanying photograph was found growing in a field near Austin, Texas, May 21, 1910. But a single individual exhibiting the anomaly was observed, and although many field trips have since inci-

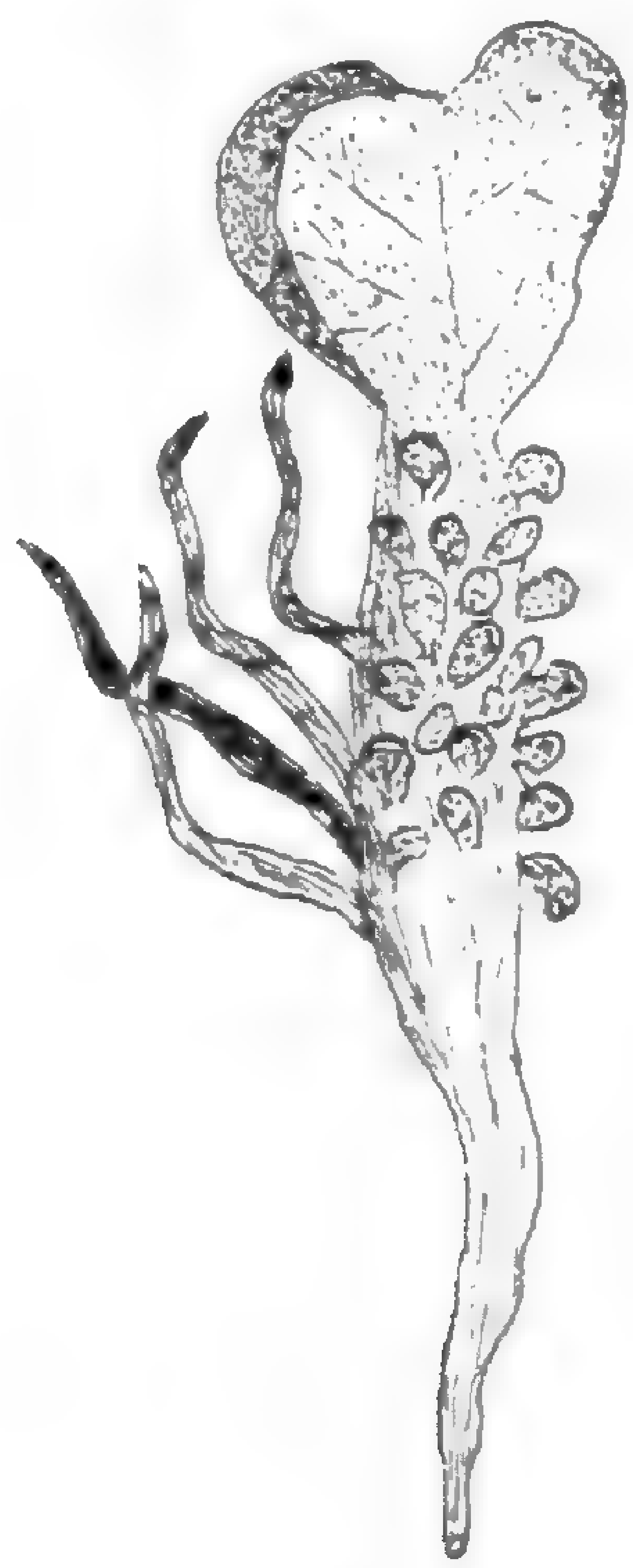

FIG. 2. A single pistillodium. Explanation in text.

dentally taken me through fields covered with this plant, casual observation has not so far revealed other specimens. I am convinced therefore that the occurrence of this condition is extremely rare in this species, although it is known to be of common occurrence among the Papaveraceae. All of the flowers of this individual are anomalous. The stamens are all changed to pistillodia, the petals are completely suppressed, and the pistil reduced to a

* DeVries, Hugo, Species and Varieties, Their Origin by Mutation, Chapter XIII, Pistillody in Poppies. 1906. Master-Dammer, Vegetable Teratology. Schilberszky, K., Adotsk a Virag szaporadi szerveinek rendellenes szerkezeteher. Beiträge zur abnormalen Structur der productiven Organe der Blüthe. (Abhandl. a. d. Geb. der Naturw., Herausg. v. d. Ung. Wiss. Akad., Bd. XXII, No. 4. 79 p. Mit 7 Taf. Budapest, 1892. Review in Just's Botanischer Jahresbericht 1: 465. 1892.)

rudimentary condition. The pistillodia remain for the most part separate, but in a few cases two or more are fused together. Both the anther and the filament of the stamen are affected. The filament is inflated into a somewhat irregularly terete organ, on the inner surface of which naked ovules are borne (Fig. 2). The outer side is covered with coarse, stiff sharp-pointed hairs resembling the same structures of the normal ovary. The anthers are replaced by an expanded leaf-like structure borne sessile on the stalk. This expanded portion is stigmatose along the edge and in some cases well-developed pollen is produced in this portion of the organ. All of the flowers were immature and consequently it is impossible to say whether seed could have been produced in such organs, or not.

AUSTIN, TEXAS.

SHORTER NOTES

AN APPARENTLY NEW RECORD FOR RUBUS CHAMAEMORUS LINNAEUS.—*Rubus chamaemorus* Linnaeus seems to be limited in its so far published range to the far northeast and north among American plants. Its occurrence south of Maine, New Hampshire and Ontario is not reported, so far as known to me.

The new record is of two specimens taken from a bed several square feet in extent in one of the bogs near Montauk Point, L. I. These plants were collected by Dr. William C. Braislin, of Brooklyn, N. Y., August 21, 1908, who recognized in the plant something not before seen by him, and they were deposited in the Museum of The Brooklyn Institute of Arts and Sciences with the request that they be named.

The occurrence of this *Rubus* on Long Island certainly is one not before suspected, and the only explanation of its occurrence in a permanent situation at Montauk Point must be due to such causes as are fully discussed by Dr. M. L. Fernald, in a recent paper containing much discussion of geographical distribution published in Rhodora, or to the direct agency of migratory birds, many of which touch Long Island in their southward flights.

E. L. MORRIS.

THE CENTRAL MUSEUM
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THE COLORADO TRADESCANTIA. It may be worth while to note that *Tradescantia* sp. T. Holm, Mem. Nat. Acad. Sci. **10**: 180, from Colorado, is *T. universitatis* Ckll.* I am confident that only one species of *Tradescantia* occurs in the vicinity of Denver and Boulder; and this, as Holm remarks, is not *T. scopulorum* Rose. Dr. Rydberg believes that *T. universitatis* is probably not distinct from *T. occidentalis* (Britton) Britton, but this conclusion is based on a restriction of *occidentalis* to the plant growing from Nebraska westward, taking as the type a sheet so labelled by Dr. Britton. I do not believe this proceeding can be justified, as the original account of *occidentalis* (*T. virginiana occidentalis*, Illust. Flora **1**: 377) ascribes it to "Wisconsin to Missouri, Texas and New Mexico," citing a western range only southward, where *T. scopulorum* grows. The leaves of our plant, also, are by no means "narrowly linear."

T. D. A. COCKERELL.

BOULDER, COLORADO.

EPIPACTIS VS. PERAMIUM.—A. A. Eaton, in the Proceedings of the Biological Society of Washington,† stated: "The name *Epipactis* appears to have been first used since 1753 by Böhmer in the third edition of Ludwig's Definitiones Generum Plantarum. Although he makes no binomial combination, his genus is properly made and he gives several references to the plant designated by Linnaeus as *Satyrium repens*, now known as *Goodyera repens* R. Br., or *Peramium repens* Salisb."

Then Mr. Eaton goes on and changes fifty-one names, transferring that many species to *Epipactis*.

In looking over Böhmer's edition of Ludwig's work, Mr. Eaton's discussion seemed correct to me at first. I was reluctant, however, to adopt such a radical change, which by the way has been accepted by the authors of the New Gray Manual, and I turned to Dr. Barnhart, asking him if he could find any flaw in the argument. He said that he could not, except that the name *Epipactis* might have been used between 1753 and 1760. He suggested that Zinn might have used it. Turning to Zinn's Cata-

* Muhlenbergia **3**: 54. 1907. Nature, Nov. 1, 1906, p. 7.

† Vol. **21**: 63. 1908.

logus Plantarum Horti Academici et Agri Goettingensis, we found that the genus was adopted on page 85. He credits the genus to Haller and gives *Serapias* and *Ophrys* Linn. as synonyms. He then gave a generic diagnosis of four lines and on the following page divides the genus into two subgenera: (1) *Helleborine* and (2) *Ophrys*. The first must be regarded as the typical *Epipactis* and the first species under this subgenus is:

"*Epipactis* (*Helleborine*) *floribus obsoleteca rneis, raris, labello obtuso*, Hall. Enum. Helo. 275," and under this is given as a synonym *Serapias* Linn. Sp. 1.

The first species of Linnaeus' Species Plantarum is *Serapias Helleborine* L., the type being the same as that of *Epipactis* Adans. Mr. Eaton's fifty-one new combinations have to pass into synonymy, and the publication of the same was a waste of time and paper.

P. A. RYDBERG.

NEW YORK BOTANICAL GARDEN.

HONORARY MEMBERS OF THE TORREY CLUB

The recent death of Sir Joseph Dalton Hooker, who was an honorary member of the Torrey Botanical Club, has served to call the attention of the active members to the matter of honorary membership. It was at the meeting held February 9, 1886, that a constitutional amendment was adopted providing that "Honorary members may be chosen from botanists who have distinguished themselves by valuable original investigations, and shall be limited in number to five." At the meeting of March 9, 1886, Asa Gray was elected to honorary membership, and was the only member of this class until his death, January 30, 1888. Upon the death of Dr. Gray, the Club remained without an honorary member for more than a year.

At the meeting of April 24, 1889, five honorary members were elected, the full number authorized by the constitution. These were: Henri Baillon, Alphonse de Candolle, Joseph D. Hooker, Carl J. Maximowicz, and Julius Sachs. Maximowicz died in February, 1891, and at the meeting of April 29, 1891, Eduard Regel was elected to fill the vacancy; Regel died a year later.

No list of the entire membership of the Club, including honorary members, has been printed since May, 1889; but an examination of the minutes has not revealed the election of any new honorary member since the death of Regel in April, 1892. De Candolle died in April, 1893; Baillon in July, 1895; Sachs in May, 1897; it would appear, therefore, that unless some election has been overlooked, Sir Joseph Hooker was the only honorary member of the Torrey Botanical Club from May, 1897, until his recent death. A much more thorough search of the Club's minutes, however, would be desirable before proceeding to the election of new honorary members upon the supposition that there are now none.

J. H. BARNHART.

PROCEEDINGS OF THE CLUB

JANUARY 31, 1912

The meeting of January 31, 1912, was held in the Museum Building of the New York Botanical Garden at 3:30 P.M., Vice-President Barnhart presiding. Twenty-five persons were present.

The minutes of the meetings of November 29, 1911, and January 9, 1912, were read and approved.

Dr. Marshall A. Howe, chairman of the auditing committee reported that the committee had examined the books of the treasurer and found them to be correct. The following report of the budget committee was then presented and approved.

Estimated Income

Members' dues	$1,035.00
Sustaining members' dues	225.00
Subscriptions, *Bulletin*	700.00
Subscriptions, TORREYA	115.00
Subscriptions, *Memoirs*	150.00
Subscriptions, *Index cards*	200.00
Advertisements	100.00
Sundry items	25.00
Total	$2,550.00

Estimated Expenses

Bulletin	$1,200.00
TORREYA	520.00
Memoirs	150.00
Index cards	150.00
Salary, Secretary and Treasurer	300.00
Reprinting old *Bulletins*	100.00
Sundry items	75.00
Total	$2,495.00
Estimated balance	55.00
	$2,550.00

Dr. N. L. Britton then read a communication from President Burgess relating to field meetings. By a vote of the Club Mr. Sereno Stetson was appointed chairman of the field committee with power to choose his associates.

The resignations of Dr. John H. Barnhart and Professor Robert A. Harper, associate editors, were presented and accepted. By vote of the Club, the board of editors was given power to fill the vacancies.

The resignation of William Rives was read and accepted.

The announced scientific program consisted of the reading of papers on Sir Joseph Dalton Hooker his Life and Works, by Dr. N. L. Britton and Dr. J. H. Barnhart. Dr. Britton's paper related chiefly to the life of this distinguished botanist, and his publications relating to botany were discussed by Dr. Barnhart. As Sir Joseph Hooker was an honorary member of the Torrey Club, Dr. Barnhart took this occasion to bring before the Club the constitutional provisions relating to honorary membership and read the list of all persons who have been elected to honorary membership.*

Mr. Fred J. Seaver spoke briefly on the viability of the spores in *Pyronema*. While *Pyronema* has been made the subject of numerous research papers and is figured and treated in most of the recent text-books of general botany it still remains an unknown plant to most botanists, except to the few who have done critical work with it. There is no reason for it being so for the fungus is fairly common and is easily grown as has already been

* See page 90.

shown in previously published papers. In a recent experiment the speaker was able to show that the spores of this fungus which had been kept nearly three years in the herbarium germinated readily in hanging-drop culture. This last point should be of general interest to teachers of botany since it means that the plant can be grown and studied from living material and the old plants then placed in an envelope and kept until the next year when they can be planted and grown again. No complicated technique is necessary for the growing of *Pyronema*. A pot of garden soil should be heated. Heating can be carried on in an autoclav or sterilizing oven. If these are not to be had bake in an ordinary oven. Saturate the soil with tap water after heating and plant the spores. Growth of mycelium should be abundant in two or three days, sex organs should appear in about a week and mature ascocarps a few days later. A more detailed account of this subject will appear in the BULLETIN of the Club.

Dr. Marshall A. Howe spoke briefly on "Some Marine Algae from the Stomach of a Peruvian Green Turtle" and exhibited specimens from the source indicated, collected in Peru by Dr. Robert E. Coker. The fragments were in a good state of preservation and two of the species concerned are readily determinable, the most abundant being *Rhodyminia flabellifolia*, a common Peruvian and Chilean species and a close relative of the edible "dulse." The alga coming next in point of abundance is *Caulerpa flagelliformis ligulata*, a species occurring elsewhere in Dr. Coker's Peruvian collections but not before reported from the shores of the American continent. Fragments of a species of *Gelidium* not so certainly determinable also occur.

Dr. W. A. Murrill gave a short account of the progress of his studies on the Agaricaceae of tropical North America and also read some mycological notes relating to the Washington meeting.

Meeting adjourned.

B. O. DODGE,
Secretary

February 13, 1912

The meeting of February 13, 1912, was held at the American Museum of Natural History at 8:15 P.M. Twenty-three persons were present.

The announced scientific programme consisted of a lecture on "Some Botanical Features of a Desert Mountain Range," by Dr. Forrest Shreve. The lecture was illustrated with lantern slides.

Meeting adjourned.

B. O. Dodge,
Secretary

NEWS ITEMS

We learn from *Science* that a comprehensive project for research on the Cactaceae has been organized by the department of botanical research of the Carnegie Institution of Washington. Dr. J. N. Rose, of the U. S. National Museum, has been appointed research associate. He has been granted a furlough from the museum, which also furnishes working quarters and facilities for handling the living collections. Dr. N. L. Britton, who has made extensive studies of the group, has also been appointed research associate, without salary. The New York Botanical Garden also contributes its extensive collections, and some of its explorational effort to the project. Dr. D. S. Johnson, of Johns Hopkins University, and Professor J. G. Brown, of the University of Arizona, will continue their studies on the Cactaceae. Other contributions will be made by the members of the staff and cooperators of the Desert Laboratory.

At the one hundredth anniversary of the Academy of Natural Sciences of Philadelphia held March 18–21, Dr. C. Stuart Gager represented the Torrey Botanical Club and also the University of Missouri.

From the *Sun* we learn that Michael H. Lawlor, an expert in the propagation and care of trees of foreign growth and known to horticulturists in all parts of the United States, has died, aged 63 years. He was born in Ireland and came to this country when a young man. He went to work for the Parsons nurseries in Flushing and assisted Robert S. Parsons in importing many varieties from Europe, Asia and Africa. The task of acclimating and caring for these trees was entrusted to Lawlor, who became an expert in that particular branch. At the death of Mr. Parsons Lawlor went into the nursery business on his own account. He retired about ten years ago. He is survived by his wife, three sons and two daughters.

Dr. George T. Moore, professor of plant physiology at the Shaw School of Botany, and until recently plant physiologist at the Missouri Botanical Garden, has been appointed director of the Garden to succeed Dr. William Trelease, who has lately resigned.

Dr. Marshall A. Howe represented the New York Botanical Garden at the one hundredth anniversary of the founding of the Academy of Natural Sciences of Philadelphia. He read a paper on "Reef-building and land-forming seaweeds."

Mr. Robert Cushman Murphy, curator of the division of mammals and birds at The Brooklyn Institute Museum, will sail early in May for the southern Atlantic. South Georgia, an island about one thousand miles east of Cape Horn, will be the objective point. Mr. Murphy will also be equipped for collecting marine and land plants. It is hoped that his collection will supplement those of the few collectors who have ever visited this botanically little-known region.

On Monday, April 8, excavation began for the first section of the laboratory building and plant houses of the Brooklyn Botanic Garden. The building, when completed, will be one story high, of brick faced with concrete, 240 feet long and 50 feet wide, with a maximum elevation of about 60 feet. The plans provide for four large laboratories for class use, three class rooms, a herbarium room, three library rooms, physiological and photographic dark rooms, a photographic operating room, a constant temperature room, an auditorium, thirteen private research rooms, and service rooms in the basement. Only about one fifth of the building will be constructed this year, and it is expected that this will be ready for occupancy before January 1, 1913.

The plant houses consist of a central palm house 104 × 45 feet, and 36 feet maximum height, with two north and two south wings, each 100 × 22.5 feet. Only the northeast wing will be built this year.

On April 10 work began on the construction of an artificial brook to extend for 1,500 feet through the central portion of the Garden. The April number of the Garden *Record* contains the first annual report.

Vol. 12 May, 1912 No. 5

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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TORREYA

May, 1912

Vol. 12 No. 5

THE FLORA OF NORTHAMPTON COUNTY, PENNSYLVANIA

By Wilbur L. King

The county of Northampton is located on the eastern border of Pennsylvania. In shape it somewhat resembles a truncated funnel lying on its side. It was formerly a portion of Bucks county from which it was separated in 1752. When originally erected it included what is now Lehigh, Schuylkill, Carbon, Monroe, Pike, and all the other counties north of them to the state of New York. In 1772 the northwestern part of the county became Northumberland county; in 1796 Wayne county took the northeastern part; in 1811 Schuylkill county was cut off; the following year Lehigh county was formed; Monroe county was laid out in 1836 and Carbon county in 1843. The present area of Northampton county is about 380 square miles.

This territory lies south of the Kittatinny mountain, sometimes known as the Blue mountain, which is a part of the Appalachian chain. The crest of the mountain forms its northern boundary and the eastern and western boundaries of the county are formed by the Delaware and Lehigh rivers respectively. These two rivers flow through gaps in the Kittatinny mountain — the Delaware river at the Delaware Water Gap in the northeast corner of the county, and the Lehigh river at Lehigh Water Gap in the northwest corner. The direction of the rivers from these gaps is SSE. The distance along the Kittatinny mountain between the two rivers, in a straight line, is twenty-seven and a half miles. The Lehigh river flows SSE. as far as Allentown. Here it is deflected ENE., making a right angle bend and, flowing past Bethlehem and Freemansburg, it empties into the Delaware

[No. 4, Vol. 12, of Torreya, comprising pp. 73–96, was issued 17 April 1912.]

river at Easton. The distance between Lehigh Gap and Allentown, by water, is eighteen miles and from Allentown to Easton fourteen miles.

There are seventeen townships in the county and all but two of them lie between the two rivers and the Blue mountain. The other two lie south of the Lehigh river. On the south the county borders on Bucks county.

Northampton county may be divided into three prominent geological regions. These are the slate belt in the northern portion, the limestone belt in the middle, and the syenite or gneiss belt in the southern portion of the county.

As has already been noted, the Kittatinny mountain extends along the northern border of the county. It is a ridge of Oneida sandstone. Its narrow, rocky crest is generally of the uniform height of 1,500 to 1,600 feet above the sea. There are, however, several depressions along its crest, among them being Little Gap, four miles east of Lehigh Gap; Tot's Gap, two and one half miles west of the Delaware Water Gap; Fox's Gap, one mile west of Tot's Gap; Wind Gap, eleven miles west of the Delaware Water Gap. Probaby the most curious is the Wind Gap which is five hundred feet deep. A railroad passes through it, the crest of the mountain east and west of it being at about 1,500 feet, while the highest railroad grade level in the gap is at 978 feet. To the south of the mountain lies the Great Valley, so called by the early settlers, but in the language of the *Lenni Lenape* or Delaware river Indians it is known as the Kittatinny Valley. The mountain, no doubt, received its name from the valley, but when seen from the southern portion of the county on a clear day it has a bluish tint, hence is frequently known as the Blue mountain.

To the south of the mountain extends a steep slope of Hudson river slate which is covered by fragments of sandstone. This slate belt occupies a nearly uniform width of about nine miles from the mountain crest and has a height of approximately two hundred feet above the flat limestone belt and extends from the Delaware to the Lehigh river. It is a region of low, flat-topped hills with numerous small valleys. The soil is largely clayey in structure.

The limestone region is about eight miles wide and lies south of the slate belt. It is in reality a great plain with many intersecting, gently sloping valleys. I quote from the Second Geological Survey of Pennsylvania where it is stated that its "north border commences about half a mile north of Siegfried's Bridge and continues nearly due east until it reaches a point a little southwest of Bath. Here it makes a northward bend of about a mile and, passing through Bath, it continues with a zig-zag border almost due east to Nazareth. At the latter point it bends toward the northeast and continues in this direction through the village of Martin's Creek and then extends as a strip about half a mile wide parallel to the Delaware river as far as Belvidere." Here it leaves Pennsylvania and crosses into New Jersey. The southern border of the limestone belt is where it meets the South mountains with this exception, that at Bethlehem it continues through a break in the mountains and forms the Saucon valley basin. This limestone plain has an elevation of about 400 feet, with the hilltops approximating 450 feet. It consists largely of rich farm lands underlaid by limestone soil and maintaining some few patches of woodland.

The South mountains or Durham and Reading hills form the southern, syenite, belt. This region lies south of the Lehigh river, extending about five miles within the county limits. It is, however, actually seven miles wide if the portion which lies in Bucks county is included. The South mountains consist of parallel highland ridges which are a continuation of the Highlands of New York and New Jersey through eastern Pennsylvania ending in the Schuylkill river in Berks county. Locally, they are also known as the Lehigh mountains. They are long and narrow ridges with gentle slopes and rounded summits with a maximum altitude of 1,100 feet. Between these ridges lie valleys of rich limestone land but the soil on the mountains is rocky and poor. The mountain slopes were at one time heavily wooded but none of the original forest remains. Second growth timber has covered portions of the hills but this is occasionally denuded in patches by mountain fires. The rock formation of these ridges has been referred to the Laurentian age. Large rounded bowlders of gneiss, once presumably a part of cliffs no longer existing, are found on the south slope of the mountain.

The limestone belt has but few streams, the drainage being principally underground through sinks. The Monocacy creek enters the limestone plain from the slate hills at Bath and empties

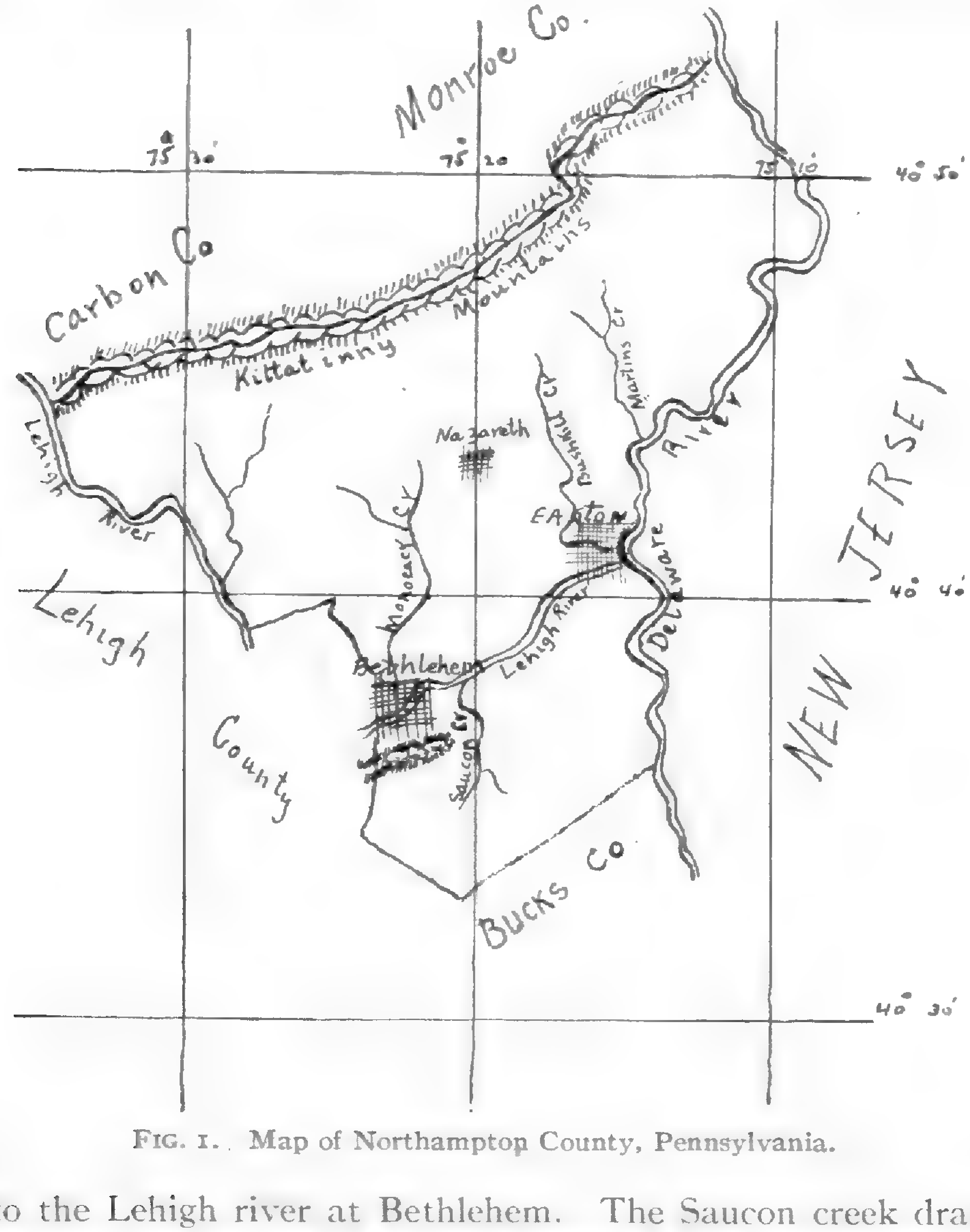

FIG. 1. Map of Northampton County, Pennsylvania.

into the Lehigh river at Bethlehem. The Saucon creek drains the beautiful Saucon Valley and flowing north empties into the Lehigh river at Freemansburg. All the rest of the streams head near the Kittatinny mountain and flow south either into the Delaware or Lehigh rivers thus flowing from the slate belt into the limestone belt.

It is probable that other conditions have as strong a bearing on the character of the vegetation of this region as its geological environment. The altitude of its hills and mountains and the character of its soil are undoubtedly determining factors of no small moment. But its sunshine, its rain, and the period between its frosts are equally worthy of notice.

It is no less a fact that the flora of Northampton County is in a large measure the product of our climate. This is of the mountain type, with rigorous winters. At Easton the average annual snowfall is about thirty-five inches and the lowest temperature recorded in eighteen years is 14° F. below zero. The highest temperature during the same time is 99° F. For a period of twenty-five years the normal annual temperature was 50.8° F. The extremes of temperature are greater in the valleys than on the uplands. The first killing frosts of autumn generally occur about the latter part of October. The last frosts in spring are usually during the month of April. The average number of rainy days with a precipitation of .01 inch or more was 114 per annum.

The following table, covering a period of ten years, taken from the records of the Weather Bureau of the United States Department of Agriculture showing the monthly, annual, and average precipitation in inches and hundredths for Bethlehem, will, no doubt, be of considerable interest. The elevation of Bethlehem is given as 260 feet.

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1888	5.08	3.50	3.84	3.30	2.84	3.12	2.64	9.20	10.93	2.77	3.82	3.60	54.64
1889	4.66	1.94	3.35	4.30	4.30	5.28	9.93	4.10	6.14	3.30	8.72	1.66	57.68
1890	2.28	4.43	6.12	2.58	7.44	3.10	6.02	5.92	3.51	6.17	0.82	2.98	51.37
1891	5.62	3.88	5.38	1.96	2.29	2.44	5.80	5.45	2.53	2.66	1.89	4.11	44.01
1892	5.76	0.62	4.67	0.70	4.40	3.89	1.37	3.33	2.54	0.44	6.70	1.60	36.02
1893	2.79	6.41	2.57	3.38	4.59	2.97	1.88	4.61	2.14	2.79	3.51	2.47	40.11
1894	1.54	4.50	1.29	2.41	10.80	2.49	2.83	2.07	8.54	5.04	2.86	4.85	49.22
1895	4.04	0.89	2.31	4.46	2.33	4.48	3.84	2.96	0.63	3.69	1.66	2.61	33.90
1896	1.26	6.41	5.82	1.27	6.30	3.60	6.13	2.22	3.68	2.77	4.32	0.70	44.48
1897	2.35	2.57	2.50	3.41	6.05	4.03	4.84	3.64	2.10	1.22	5.99	4.22	42.92
M'ns	3.53	3.51	3.78	2.77	5.13	3.54	4.53	4.35	4.27	3.09	4.03	2.88	45.43

In addition to its geology and climate, its commerce is another factor which must be taken into consideration in a survey of the flora of the county, at the present time. In observing the plants growing in this region it is particularly noticeable that many of the species are not natives of the soil but have been introduced from other lands. The seeds have been scattered through the importation of products from other states and countries, and we find to-day that about twenty-five per cent. of our flora is exotic. Through changes of physical environments some of our indigenous species have become extinct in this locality. Even some of the localities have become extinct as will be noted by the reference to plants found on Calypso Island. This island comprised about twenty acres of woodland and was situated in the Lehigh river at Bethlehem, a part of it being in Northampton county. About seven years ago its large and beautiful trees were cut down and the island dug away and the south channel of the river filled in to become the roadbed of a railroad.

In the following list grateful acknowledgment is made to Dr. Porter's Flora of Pennsylvania for many species noted therein as having been found in the county; also to Mr. John A. Ruth and Mr. George W. Caffrey both of Bethlehem who have kindly furnished notes from their herbaria. The writer's herbarium contains a majority of the plants noted.

OPHIOGLOSSACEAE

OPHIOGLOSSUM VULGATUM L. Professor Englemann had a specimen collected by E. Durand at Bethlehem in 1853 with small lanceolate fronds; most of the plants, however, were immature. (Bull. Torrey Club **24**: 548. 1897.)

BOTRYCHIUM VIRGINIANUM (L.) Sw. In woods on Lehigh Mt. Variable in size. July 19, 1897.

OSMUNDACEAE

OSMUNDA REGALIS L. In marshy ground along mountain streams on Lehigh Mt. about one mile from South Bethlehem at an altitude of about 940 feet. May 30, 1900.

OSMUNDA CINNAMOMEA L. Along the banks of mountain streams in rocky soil on Lehigh Mt.; also along the Lehigh river. Common. May 20, 1897.

OSMUNDA CLAYTONIANA L. In open woods on Lehigh Mt. and in association with the preceding. May 30, 1897.

POLYPODIACEAE

ONOCLEA SENSIBILIS L. Along the banks of the Lehigh river and Monocacy creek. In moist soil on Lehigh Mt. July 15, 1899.

MATTEUCCIA STRUTHIOPTERIS (L.) Todaro. Reported by Mr. H. W. Pretz as having been found along the Hokendauqua creek and near Nazareth, but now extinct at these places. (Bull. Torrey Club **38**: 68.)

DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore. On open hillsides, Lehigh Mt. Growing in patches.

DRYOPTERIS ACROSTICHOIDES (Michx.) Kuntze. On rocky hillsides and in woods on Lehigh Mt. June 5, 1897.

DRYOPTERIS NOVEBORACENSIS (L.) A. Gray. In woods on Lehigh Mt. (J. A. Ruth.)

DRYOPTERIS THELYPTERIS (L.) A. Gray. Along mountain streams near Lehigh University. (J. A. Ruth.)

DRYOPTERIS MARGINALIS (L.) A. Gray. Common along the Lehigh river and in rocky woods on Lehigh Mt. July 15, 1899.

PHEGOPTERIS PHEGOPTERIS (L.) Underw. Along mountain streams, Lehigh Mt. (J. A. Ruth.)

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. On limestone rocks in shaded situations along Monocacy creek two miles from Bethlehem.

ASPLENIUM EBENOIDES R. R. Scott. On limestone rocks on the Lehigh river near Easton. (Porter.)

ASPLENIUM TRICHOMANES L. On limestone rocks near Freemansburg. Sept. 4, 1899.

ASPLENIUM MONTANUM Willd. At Weyget above Easton. (Porter.)

ASPLENIUM ACROSTICHOIDES Sw. Along mountain streams, Lehigh Mt. (J. A. Ruth.)

ASPLENIUM FILIX-FOEMINA (L.) Bernh. Along the Lehigh canal and river. July 15 to Sept. 4, 1899. Common.

ADIANTUM PEDATUM L. Common in woods on Lehigh Mt. Preferring moist situations. July 4, 1900.

PTERIDIUM AQUILINUM L. (Kuhn). In dry open woods, Lehigh Mt. July 1, 1899.

PELLAEA ATROPURPUREA (L.) Link. On limestone rocks near Freemansburg. Sept. 4; also at Easton.

POLYPODIUM VULGARE L. In woods on Lehigh Mt.; in rocky situations near Wind Gap.

EQUISETACEAE

EQUISETUM ARVENSE L. In sandy soil along Lehigh river and Monocacy creek. May, 1897.

EQUISETUM HYEMALE L. In thickets along Monocacy creek. May, 1898.

SELAGINELLACEAE

SELAGINELLA APUS (L.) Spring. Along cold brooks on Lehigh Mt. July 29, 1899.

PINACEAE

PINUS STROBUS L. In cultivation in cemetery at Bethlehem.

PINUS VIRGINIANA Mill. In sandy soil. (Porter.)

PINUS RIGIDA Mill. In dry, sandy or rocky soil. (Porter.)

TSUGA CANADENSIS (L.) Carr. In stony or rocky soil. (Porter.)

THUJA OCCIDENTALIS L. Along Lehigh river at Freemansburg; cultivated in yards and cemeteries. June 11, 1900.*

JUNIPERUS VIRGINIANA L. On rocky slopes along Monocacy creek.

TYPHACEAE

TYPHA LATIFOLIA L. In marshes along Monocacy creek and along Lehigh canal near Freemansburg. July 26 to Sept. 26, 1895.

TYPHA ANGUSTIFOLIA L. In marshes. (Porter.)

SPARGANIACEAE

SPARGANIUM EURYCARPUM Engelm. In meadows along Monocacy creek two miles north of Bethlehem. June 23, 1902. (J. A. Ruth.) Along bank of Lehigh river at Island Park, Aug. 25, 1903.

SPARGANIUM ANDROCLADUM (Engelm.) Morong. In swamps or shallow water. (Porter.)

* This evergreen, reports in various works to the contrary notwithstanding, has yet to be collected as a wild plant in Pennsylvania.—ED.

NAIADACEAE

POTAMOGETON NATANS L. In Monocacy creek 3 miles from Bethlehem. Aug. 20, 1899.
POTAMOGETON AMPLIFOLIUS Tuckerm. In lakes and ponds. (Porter.)
POTAMOGETON PULCHER Tuckerm. In slow streams or ponds. (Porter.)
POTAMOGETON NUTTALLII Cham. & Sch. In stream at Easton. (Porter.)
POTAMOGETON LONCHITES Tuckerm. In stream at Easton. (Porter.)
POTAMOGETON PERFOLIATUS L. In Delaware river. (Porter.)
POTAMOGETON PERFOLIATUS RICHARDSONII A. Bennett. At Easton. (Porter.)
POTAMOGETON CRISPUS L. In Monocacy creek about 2 miles from Bethlehem, June 23, 1902; also in Lehigh river and Bushkill creek.
POTAMOGETON OBTUSIFOLIUS Mert. & Koch. In stream at Easton. (Porter.)
POTAMOGETON DIVERSIFOLIUS Raf. In still water. (Porter.)
POTAMOGETON DIVERSIFOLIUS MULTIDENTICULATUS Morong. At Easton. (Porter.)
POTAMOGETON PECTINATUS L. In stream at Black Horse Tavern. (Porter.)
POTAMOGETON ROBBINSII Oakes. In Lehigh river.
ZANNICHELLIA PALUSTRIS L. In ponds and ditches. (Porter.)
NAIAS FLEXILIS (Willd.) Rost. & Schmidt. In ponds and streams. (Porter.)

ALISMACEAE

ALISMA PLANTAGO-AQUATICA L. On muddy banks of the Lehigh river near Bethlehem. July 15, 1899.
SAGITTARIA ENGELMANNIANA J. G. Smith. In swamps along Monocacy creek, Aug. 12, 1899, and on mud flats along the Lehigh river at Island Park, Aug. 25, 1902.
SAGITTARIA LATIFOLIA Willd. In shallow water along Monocacy creek and Lehigh river. Aug. 5, 1899.
SAGITTARIA LATIFOLIA PUBESCENS (Muhl.) J. G. Smith. At Seidersville. (Porter.)
SAGITTARIA RIGIDA Pursh. In wet sandy soil along Lehigh river at Island Park. Aug. 25, 1902.
SAGITTARIA GRAMINEA Michx. In shallow water or mud. (Porter.)

VALLISNERIACEAE

PHILOTRIA CANADENSIS (Michx.) Britton. In Lehigh river and Monocacy creek.
VALLISNERIA SPIRALIS L. In the Lehigh canal near Glendon.

GRAMINEAE

ANDROPOGON SCOPARIUS Michx. Along Lehigh Valley R. R. near Bethlehem. Aug., 1899.
ANDROPOGON FURCATUS Muhl. In dry soil along the Monocacy creek one mile from Bethlehem. Aug. 11, 1899.
ANDROPOGON VIRGINICUS L. In sandy soil in thickets, Bethlehem. Aug. 5, 1899.
CHRYSOPOGON AVENACEUS (Michx.) Benth. In dry soil along the towpath between Bethlehem and Freemansburg. Sept. 4.
PASPALUM MUHLENBERGII Nash. In sand or stony ground. (Porter.)
PASPALUM LAEVE Michx. In fields. (Porter.)
SYNTHERISMA SANGUINALE (L.) Dulac. In cultivated and waste places. Common. July 15, 1899.
SYNTHERISMA HUMIFUSUM (Pers.) Rydb. In cultivated field near Bethlehem. Sept. 7, 1899.
ECHINOCLOA CRUS-GALLI (L.) Beauv. Common in cultivated and waste places.
PANICUM CAPILLARE L. In dry soil, in fields and roadsides. Aug. 16, 1899.
PANICUM PHILADELPHICUM Bernh. In dry soil at Bethlehem. Aug. 7, 1899.
PANICUM MILIACEUM L. In waste places. (Porter.)

PANICUM PROLIFERUM Lam. In moist sandy situations, Bethlehem. Aug. 21, 1899.

PANICUM VIRGATUM L. In moist or dry soil. (Porter.)

PANICUM AGROSTOIDES Spreng. In wet grounds. (Porter.)

PANICUM LONGIFOLIUM Torr. In wet ground along towpath between Bethlehem and Freemansburg. Sept. 4, 1899.

PANICUM STIPITATUM Nash. In moist soil. (Porter.)

PANICUM ANCEPS Michx. In wet or moist ground along towpath near Freemansburg; and along Saucon creek 1½ miles from its mouth. Sept. 4, 1899.

PANICUM LINEARIFOLIUM Scribn. In dry soil, especially on hillsides. (Porter.)

PANICUM DEPAUPERATUM Muhl. In dry soil on hillsides with northern exposure near South Bethlehem. May 20, 1899.

PANICUM DICHOTOMUM L. On shaded hillsides, Lehigh Mt.

PANICUM BARBULATUM Michx. In moist soil. (Porter.)

PANICUM BOREALE Nash. In moist soil. (Porter.)

PANICUM NITIDUM Lam. In woods, Lehigh Mt.

PANICUM IMPLICATUM Scribn. In dry soil. (Porter.)

PANICUM UNCIPHYLLUM Trin. In dry soil. (Porter.)

PANICUM ATLANTICUM Nash. In dry soil. (Porter.)

PANICUM TENNESSEENSE Ashe. In woods. (Porter.)

PANICUM SCRIBNERIANUM Nash. In dry or moist soil at Easton. (Porter.)

PANICUM SPHAEROCARPON Ell. In dry soil. (Porter.)

PANICUM COMMUTATUM Schultes. In dry woods and thickets. (Porter.)

PANICUM MACROCARPON Le Conte. In moist places. (Porter.)

PANICUM PORTERIANUM Nash. In woods on Lehigh Mt. south of Lehigh University. June 15, 1900. (J. A. Ruth.)

PANICUM PUBIFOLIUM Nash. In rocky woods. (Porter.)

PANICUM CLANDESTINUM L. In thickets near Bethlehem. July 29, 1899.

CHAETOCHLOA GLAUCA (L.) Scrib. In waste places and cultivated grounds. Common.

CHAETOCHLOA VERTICILLATA (L.) Scrib. In waste places. Aug. 9, 1899. Bethlehem.

CHAETOCHLOA VIRIDIS (L.) Scrib. In waste places and cultivated grounds about Bethlehem.

CHAETOCHLOA ITALICA (L.) Scrib. Occasionally in waste places.

CENCHRUS TRIBULOIDES L. In dry soil along towpath near Bethlehem. Aug. 22, 1899.

HOMALOCENCHRUS VIRGINICUS (Willd.) Britton. In wet soil along Lehigh River near Bethlehem. Aug. 5, 1899.

HOMALOCENCHRUS ORYZOIDES (L.) Poll. In moist soil along Monocacy creek, Bethlehem. Sept. 3, 1899.

PHALARIS ARUNDINACEA L. In meadows along Monocacy creek, Bethlehem. June 11, 1900.

PHALARIS CANARIENSIS L. In dry soil along towpath near Bethlehem. July, 1902. (J. A. Ruth.)

ANTHOXANTHUM ODORATUM L. Common in dry soil on Lehigh Mt. near Lehigh University. May 20, 1899.

ARISTIDA DICHOTOMA Michx. In woods on Lehigh Mt. Sept., 1899.

ARISTIDA GRACILIS Ell. In dry soil. (Porter.)

ARISTIDA PURPURASCENS Poir. In dry soil. (Porter.)

MUHLENBERGIA SOBOLIFERA (Muhl.) Trin. In dry rocky woods one mile east of Bethlehem. Sept. 4, 1899. Altitude 360 feet.

MUHLENBERGIA MEXICANA (L.) Trin. In fields and hedges, Bethlehem. Sept. 16, 1899. Altitude 350 feet.

MUHLENBERGIA SYLVATICA Torr. In moist woods and along streams. (Porter.)

MUHLENBERGIA TENUIFLORA (Willd.) B.S.P. In rocky woods. (Porter.)

MUHLENBERGIA DIFFUSA Schreb. Along roadsides, Bethlehem. Sept. 16, 1899.

BRACHYELYTRUM ERECTUM (Schreb.) Beauv. In moist places or woods. (Porter.)

PHLEUM PRATENSE L. Common in fields.
SPOROBOLUS LONGIFOLIUS (Torr.) Wood. In dry soil. (Porter.)
CINNA ARUNDINACEA L. In moist woods and swamps. (Porter.)
AGROSTIS ALBA L. In cultivated fields. Common.
AGROSTIS PERENNANS (Walt.) Tuckerm. In moist soil along canal near Bethlehem. Aug. 20, 1899.
AGROSTIS CANINA L. In meadows along Delaware river above Easton. (Porter.)
AGROSTIS HYEMALIS (Walt.) B.S.P. In dry or moist soil. (Porter.)
AGROSTIS SCRIBNERIANA Nash. In dry soil. (Porter.)
CALAMAGROSTIS CANADENSIS (Michx.) Beauv. In swamps and wet, often sandy, soil. (Porter.)
HOLCUS LANATUS L. In meadows along Monocacy creek near Bethlehem. May 30, 1900.
AIRA PRAECOX L. In dry fields, Bethlehem. (Porter.)
DESCHAMPSIA FLEXUOSA (L.) Trin. In dry, sandy soil. (Porter.)
TRISETUM PENNSYLVALICUM (L.) Beauv. In a ravine, Lehigh Mt., near Lehigh University. June 15, 1900. (J. A. Ruth.)
AVENA SATIVA L. Cultivated and in waste places.
ARRHENATHERUM ELATIUS (L.) Beauv. In fields and waste places. (Porter.)
DANTHONIA SPICATA (L.) Beauv. In dry soil. (Porter.)
DANTHONIA COMPRESSA Austin. In woods, Lehigh Mt. July 1, 1899. (J. A. Ruth.)
CAPRIOLA DACTYLON (L.) Kuntze. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Torrey Bulletin Jan., 1892. (Porter.)
BOUTELOUA CURTIPENDULA (Michx.) Torr. In rocky woods one mile east of Bethlehem. Sept. 4, 1899. Altitude 360 feet.
ELEUSINE INDICA (L.) Gaertn. Along roadsides and waste places, Bethlehem. Aug. 5, 1899.
SIEGLINGIA SESLERIOIDES (Michx.) Scribn. In sandy soil along towpath east of Bethlehem. Aug. 5, 1899.
ERAGROSTIS CAPILLARIS (L.) Nees. In dry soil at Bethlehem. Aug. 7, 1899.
ERAGROSTIS FRANKII Steud. Along Delaware River above Easton. (Porter.) In fields and along roadsides, Bethlehem.
ERAGROSTIS PURSHII Schrad. At Easton. (Porter.) Along railroad tracks east of Bethlehem, and in dry soil along roadside. Aug. 5, 1899.
ERAGROSTIS MAJOR Host. In dry soil. Bethlehem. Aug. 9, 1899.
ERAGROSTIS PECTINACEA (Michx.) Steud. Common in waste places at Bethlehem. Aug. 5, 1899.
ERAGROSTIS HYPNOIDES (Lam.) B.S.P. On sandy shore of Lehigh river at Bethlehem; also on Calypso Island. Aug. 22, 1899.
EATONIA PENNSYLVANICA (DC.) A. Gray. In moist shady places along bank of Lehigh river one mile east of Bethlehem. June 3, 1899.
EATONIA NITIDA (Spreng.) Nash. In dry woods. (Porter.)
DACTYLIS GLOMERATA L. In fields and waste places. Very common.
POA ANNUA L. Common in fields and waste places.
POA COMPRESSA L. Common in fields and waste places.
POA PRATENSIS L. In fields and meadows. Common.
POA TRIVIALIS L. In meadows at Bethlehem. June 11, 1900. (J. A. Ruth.)
POA FLAVA L. In swampy places. (Porter.)
POA BREVIFOLIA Muhl. In rocky woods. (Porter.)
PANICULARIA NERVATA (Willd.) Kuntze. In moist soil along canal, Bethlehem. June 20, 1899.
PANICULARIA AMERICANA (Torr.) MacM. In moist soil, South Bethlehem.
PANICULARIA PALLIDA (Torr.) Kuntze. In shallow water. (Porter.)
PANICULARIA FLUITANS (L.) Kuntze. In swamps, wet places or in water. (Porter.)
FESTUCA OCTOFLORA Walt. In fields and waste places. (Porter.)
FESTUCA OVINA DURIUSCULA (L.) Hack. In dry soil. (Porter.)
FESTUCA ELATIOR L. In fields and waste places. (Porter.)

Festuca nutans Willd. In woods on Lehigh Mt. July 1, 1899. (J. A. Ruth.)
Bromus ciliatus L. In woods and moist thickets. (Porter.)
Bromus tectorum L. In streets of Easton. (Porter.)
Bromus sterilis L. In waste places, Easton. (Porter.)
Bromus Kalmii A. Gray. In moist woods and thickets. (Porter.)
Bromus secalinus L. In waste places and roadsides at Bethlehem. June 25, 1902.
Bromus racemosus L. In waste places and in dry soil at Bethlehem. May 23, 1899.
Lolium perenne L. Along roadsides and in waste places, Bethlehem. July 10, 1899.
Lolium temulentum L. In waste and cultivated grounds. (Porter.)
Agropyron repens (L.) Beauv. Around stables and in waste places, Bethlehem. June 21, 1899.
Elymus striatus Willd. In woods and on banks, Easton. (Porter.)
Elymus virginicus L. In moist sandy soil along Lehigh river near Bethlehem. Aug. 22, 1899.
Elymus canadensis L. In moist sandy soil along towpath east of Bethlehem. Aug. 5, 1899.
Hystrix Hystrix (L.) Millsp. In shady places along Saucon creek ½ mile from its mouth. Sept. 4, 1900.

(*To be continued*)

SOME RARE OHIO PLANTS FROM ASHTABULA COUNTY, OHIO

By Otto E. Jennings

During the latter part of the summer there came to me an inquiry from my friend Mr. Robert J. Sim regarding the possible occurrence of the rare orchid, *Tipularia discolor* (Pursh) Nuttall, in Ashtabula County, Ohio. A doubt having been expressed that the orchid would be found that far north, Mr. Sim expressed his firm belief in the correctness of his record and, later in the season, October 5, 1911, sent in to the Carnegie Museum several fine specimens of the plants, one of the plants still retaining the dead flower-stalk and seed-pods. Part of these plants were pressed and entered in the Herbarium of the Carnegie Museum, and part of them planted on the grounds of Dr. J. F. Shafer, the Pittsburgh orchid specialist. Accompanying the plants came from Mr. Sim a pencil sketch of flowers bearing the legend "Aug. 1, 1903, Andrew's Wood. 4 or 5 plants found. Jefferson, O.," and also a sketch done in color showing the single erect leaves, beautifully purplish dorsally. The color sketch bore the label "Andrews' Wood, Oct. 22, 1903. Jefferson, Ohio."

That Mr. Sim's station for *Tipularia* is a notable one appears at once from an examination of the areas of distribution accorded the species in the manuals. Britton's Manual, 2d edit., 1905, says: "In woods, Vt. to Mich., south to Fla. and La. Local and rare." Gray's Manual, 7th edit., 1908, restricts the range, thus: "A southern species, extending northw. to N. J.; reported but unverified from farther north." In the Emendations to the

FIG. 1. The Crane-Fly Orchis (*Tipularia discolor*) as sketched from nature by Mr. R. J. Sim. Found growing in "Andrew's Wood," near Jefferson, Ashtabula County, Ohio; flowers, August 1, 1903; leaves, October 22, 1903.

Seventh Edition of Gray's Manual.—I. Robinson and Fernald, Rhodora **11**: 33–61. March, 1909, the data of distribution were again changed to "Woods, N. J. and e. Pa. to Fla. and La.; also Cuyahoga Co., O. (Bassett)." Regarding the localities recorded in eastern Pennsylvania, the present writer finds records of occurrence in only the extreme southeastern corner of the state, Delaware County; while for New Jersey the record is for Gloucester County, south of Philadelphia, and Cape May County in the extreme southern end of the state.

In the light of the data given above it appears that the emendations to the last Gray's Manual would give to Ohio the honor of "farthest north" in the distribution of *Tipularia* and a glance at the map shows that the new station at Jefferson, Ohio, marks the extreme northern limit in the known distribution of the orchid. This last station is considerably farther north than either of the Ohio stations previously reported—Lorain and Cuyahoga Counties—Ohio Naturalist, **10**: 34. December, 1909.

In the latter part of August (1911) the writer had the pleasure of being guided by Mr. Sim up the gorge of Ashtabula Creek for perhaps two miles above the town of Ashtabula. To a naturalist this is a delightful place, abounding in insects and plants, and in the soft shales of the perpendicular bluffs bounding the gorge on either side are excellent brachiopods and cone-in-cone structures. Mr. Sim pointed out some large patches of *Tussilago Farfara* L. growing vigorously on the damp talus at the base of the bluff along the stream. This species is an interesting example of the spread of an introduced plant, it now being found in the East from Philadelphia to eastern Quebec and in various places along the Great Lakes to Minnesota. It occurs in several places near Erie, Pennsylvania; and besides Ashtabula County it has been reported in at least two other lake counties of Ohio,—Cuyahoga and Lake.

In places along Ashtabula Creek the shaly bluffs rise almost perpendicularly to a height of perhaps one hundred and twenty-five feet; and here and there have a more or less well-developed forest-covering, which might be designated as a hemlock-birch association, with also much of the white pine and mountain maple (*Acer spicatum*). The birch has proved to be interesting, as approaching pretty closely the typical form of *Betula lutea* Michx. f., but yet differing in several points. The leaves are quite typically those of *B. lutea* in the subcordate form, quite pubescent beneath and with a larger number of veins than in *B. lenta;* the bark is yellowish and peels off in thin layers; the pistillate aments are nearly sessile, oblong, up to 3 cm. long; the bracts are pubescent, marginally ciliate, divided about to the middle into three equal lobes which diverge rather widely, the mature bracts reaching usually about 1 cm. long by 1 cm. wide and the angle formed at the base of the bract by the almost straight sides being practically a right angle; and the nut is narrowly obovate and slightly wider than the wing. In the rather constantly subcordate base of the leaves and in the more widely diverging lobes of the fruiting scales the Ashtabula specimens suggest a tendency towards the *Betula alleghanensis* of Britton, and it is not improbable that more typical specimens of this latter *Betula* might be found in the Ashtabula corner of Ohio.

CARNEGIE MUSEUM,
November 30, 1911

SOME MODERN TRENDS IN ECOLOGY

BY NORMAN TAYLOR

When Ernst Haeckel, in 1866, first used the term *ecology*, it is safe to say that he little realized how the word would ultimately be construed to cover a very different set of biological factors from those described by him. Not only has the word *ecology* had a somewhat checkered career, having to stand as the outward and visible sign of many phases of biological activity, but it seems quite likely that a rather large section of that science which deals with organisms in their relation to environment has wrongfully appropriated this much used and sadly misunderstood word.

Let us hastily review the use of it by the chief exponents of what is just now a very important feature of botanical literature. While it has been stated that Haeckel first coined the term, the principles underlying the concept of ecology are very ancient. Without unearthing the more or less apocryphal progenitors of the idea, one distinguished figure of the last century stands out with whom we must reckon. Writing in 1836 Meyen has this to say: "The station (ecology) of plants denotes the relation in which the plants stand to the situation in which they always grow." This master in the study of plant geography recognizes, but does not specifically define, ecology. The passage quoted above is the epitome of Meyen's idea of ecology, and his treatment of it is mostly physiographic and edaphic. He thinks and writes of plant ecology in terms denoting unmistakably that the relation of plants *en masse* to their environment is, to him, the crux of the question.

Warming, the father of modern plant ecology, delimited the concept thus, in 1895: Ecology "teaches us how plants or plant communities adjust their forms and modes of behavior to actually operating factors, such as the amounts of available water, heat, light, nutriment, and so forth." This landmark in the development of the science is almost exclusively physiographic in its scope, and throughout it is the relation of plants *en masse*, and plant communities, to their environment that is considered fundamental. That these "actually operating factors" must, of course, operate on individuals, in order to have the least effect upon the distribution of collections of plants, was fully recognized by the author.

He did not, however, consider these purely physiologic and morphologic adaptations of individuals as the principal feature of ecology, for his book is mainly a descriptive study of vegetation.

In this country, one of the first to use the term and the first to make a serious contribution to the science, was MacMillan. During 1897, in his Minnesota Botanical Studies, which were wholly physiographic in character, he says: "That branch of biology which concerns itself with the adaptation of organisms to their surroundings, is . . . termed ecology." His Metaspermae of the Minnesota Valley marks the beginning of a voluminous literature of a distinctly ecological trend, notwithstanding the fact that this particular work was phytogeographical, which is quite another thing. That MacMillan, in most of his writings, was an ecological plant geographer and that the distribution of plants *en masse* was the chief interest with him, is the only conclusion that forces itself on his numerous readers.

We have, then, still with us in 1897, the word *ecology*, which, if not actually, had by usage become a symbol of a rather definite idea, almost exclusively physiographic in scope.

Omitting the several hundred papers of varied size and begotten of various concepts of the science, let us quote another figure of prominence in the field. Coulter, in his Plant Structures (1900), defines the field of ecology thus: "It treats of the adjustments of plants *and their organs* to their physical surroundings, and also their relations with one another and with animals, and has sometimes been called 'plant sociology.'" The italics are mine. While this was not the genesis of a new phase of ecology, it was at least one of the first prominent expositions of the indisputable fact that adjustments of plants and plant communities to their environment must, in the last analysis, rest upon the adjustment of the organs of individual plants to external influences. It is merely an elaboration of the fact noted by Warming in 1895, that the distribution of plants must be correlated with the adjustment of the individual plant. That plant communities depend for their existence upon the community of response in the organs of individuals of the society or association, seems so self evident, that it is strange the idea was not very strongly exploited before the passage quoted above was written. We see here one of the first extensions of the concept of *ecology* to cover a new set of activities, a partial transference of the idea from plants to their organs. This addition, while not revolutionary, is significant, and hereafter we find a broader note throughout ecological literature. Some of Coulter's writings have been "ecology" of the old order, although he seems to be one of the first figures of prominence to draw attention to the individualistic and functional phase of the science.

From 1900 until 1905 the number of ecological papers published was enormous and much of it was the descriptive study of vegetation. But mark how the best known exponent of the plant association-idea limits his definition of the science in his Research Methods in Ecology (1905): "The clue to the field of ecology is found in the Greek word οἶκος, home. [It] . . . has been largely the descriptive study of vegetation; physiology has concerned itself with function; but, when carefully analyzed, both are seen to rest upon the same foundation." Notwithstanding the last part of this statement, most of the ecological writing of

Professor Clements has been the descriptive study of vegetation. All but sixty pages of the work just cited are devoted to phases other than the functional side of ecology.

From the time of this work until the present, most of the men engaged in ecological work have laid more emphasis upon the physiographic side of the subject than upon the individual response of plant organs. Transeau, Shreve, Clements, Gleason, R. M. Harper, Spalding, Harshberger, Drude, and Cowles, to mention only a few, have written papers which, in the main, discussed the physiographic features of the science.

It would be unfair to those mentioned above to infer that they have ignored the question of the individual response of plant organs to environmental factors as being the controlling agency in the occurrence of plant communities. But it may be said, with a large measure of truth, that most of them while thoroughly realizing the fundamental nature of this proposition, have seen fit to lay stress rather upon the physiographic problems than upon those of functional and individual adaptations.

In other words, the term *ecology* has grown enormously in significance since the time of 1897. It has so broadened its scope that to-day one of the chief American exponents of the science not only maintains that the physiologic and morphologic response of plant organs are the main features of ecology, but unlike most of his predecessors, he devotes nine tenths of his book to these phases of the subject. Professor Cowles, in the introduction to his new text book,* has this to say, in explaining the change of emphasis: "Plant ecology has a two-fold aspect: the one considers the individual organism and its component parts as related to environment; this, since it overlaps morphology and physiology may be called *morphological and physiological ecology*, or the ecology of plant structure and behavior. The other aspect considers plants *en masse* as related to soil and climate; this, since it overlaps physiography, may be called *physiographic ecology*, or the ecology of vegetation."

Less than ten pages of the present work are devoted to plant

* Coulter, J. M., Barnes, C. R., and Cowles, H. C., A Textbook of Botany for Colleges and Universities, Vol. II, Ecology, pp. i–x + 485–964, figs. 700–1234. American Book Co., N. Y. $2.00. [December, 1911.]

associations and related phases of the subject, and all the rest of the book deals with the morphologic and physiologic home-economy of plant organs and behavior. This, to quote the preface, has been done "to develop certain general conceptions that are felt to be fundamental." It should be stated, however, that the work is not for professional ecologists.

Within the limits of Professor Cowles' restrictions, it would be difficult to imagine a more complete or satisfactory treatment of the underlying foundations of ecology. Roots and rhizomes are first discussed in their relation to absorptive, anchoring and propping functions. Under "root hairs" there is a long discussion of different soil constituents, bog water, salts of various kinds, and so forth, and the effect these have on plants. Soil exhaustion and its relation to deleterious root excretion is also discussed.

In the long chapter on the ecology of leaves, the first part is given over to the discussion of chlorophyll and food manufacture, and later the structure and arrangement of chlorenchyma is presented. "The Relation of Leaves to Light," "Air Chambers and Stomata," "Protection from Excessive Evaporation," "Variations in Leaf-form," "Absorption of Water and Non-gaseous Solutes of Leaves," "Leaves as Organs of Secretion and Excretion," "Leaves as Organs of Accumulation of Water and Food," and "Miscellaneous Leaf Structures and Relations," are all sections of this chapter and will give the reader an idea of the scope of the work.

Lack of space forbids discussion of the subjects presented in this chapter, but it may be questioned by some whether the sparse undergrowth of hemlock forests is mostly a matter of shade (p. 546); for is it not related also to the excessive amount of tannic acid leached from the trunk and branches during rains, and perhaps also in part to toxicity of the decayed leaves of the hemlock?

In the chapter devoted to stems, a large variety of subjects are discussed, such as stems as organs of display, reproductive organs, conductive and mechanical tissue, and the accumulation of food and water in stems. All the features of ecological significance are treated in detail and with a thoroughness that should set an ideal for all users of the book. On page 708 the statement that "alligator" bark is caused by the division of the bark into blocks of somewhat equidistant transverse and longitudinal furrows may excite some comment. It is quite certain that the peculiar bark feature there described may be characterized by such furrows, but hardly *caused* by them. This touches closely the question of anthropomorphism, which while specifically disavowed by Professor Cowles, is nevertheless a common form of expression throughout the book. Without a skillfully devised and obviously clumsy form of expression, it is almost impossible to write of the ecological factors of plant economy without drifting into a more or less anthropomorphic style.

It may be truthfully stated that no recent text book has given such a thoroughly satisfactory treatment of saprophytism and symbiosis in so far as these subjects deal with ecological problems, as the one at hand. The principles underlying the functional activity of plants wholly autophytic and those "whose existence depends upon antecedent or coexistent organic forms," must be recognized by those who study the habits and environmental necessities of plants. Furthermore, the practical bearing of the subject is limitless, as the cultivation of crops and of thousands of individual plants can only be successfully accomplished by a thorough understanding of this perplexing relation of one plant upon another, and by the application of these principles to horticultural and agricultural practice. In the section dealing with parasitism there is a discussion of grafting and the influence of stock and scion upon each other. The formation of galls, nitrogen-fixing bacteria, and the mycorhizal problem, together with the nature of lichen symbiosis, are also fully discussed.

More than one hundred pages are given over to reproduction and dispersal, both in the so-called seedless plants and in the Spermatophyta. Among the latter, particular attention is drawn to the modes of pollination by wind and water, and a long discussion of insect pollination deals with this important branch of ecology. This, almost exclusively, deals with the intricate methods of pollination in various types of flowers and by various types of insects, scarcely at all with the ultimate effects of these operations. This point of view, however, colors the whole tone of the book, as one might expect from the exposition quoted above. It is not the effects upon the distribution of plants that it is aimed to present, so much as the individual response of the organs of plants to external environmental factors. It may be questioned by some, that in view of the distributional phase of ecology which has hitherto appropriated so much attention, it should not have received more notice from the author of the present work. That it has not indicates, at least, a significant trend in modern ecology.

After a short chapter on germination in its relation to ecological problems, Professor Cowles takes up the much discussed and perhaps much overdone question of "Plant Associations." As an antidote for the association-idea run riot, to which we have unfortunately become accustomed, this chapter is the most effective imaginable. Coming as it does from an authoritative American ecologist, it should serve to check those who have written as though the minute description of somewhat similarly constituted vegetation areas, was the end and aim of ecology. One very necessary concomitant of the study of plant associations, Dr. Cowles has probably intentionally omitted, perhaps because the book was intended for undergraduate use. But it seems doubtful if one can intelligently study the associations of plants, without taking into account the ancestral history of the species or genera under consideration. This, of course, involves larger problems of geographical distribution, center and periphery of distributional frequency, climatic factors, and the geological history of the area treated.

In bringing to a close this somewhat brief outline of this work, scholarly in its treatment, broad in its outline and comprehensive in its ideas as to the fundamentals of plant ecology, as the author has by his treatment conceived that science, it is a pleasure to record the fact that it will undoubtedly be a standard book on the subject for years to come. A bibliography and an index complete the usefulness of the work for the student. I have found only a single error of fact, on page 495, where the wholly marine *Zostera* is stated to be a salt marsh plant.

Some there are who will feel that the evolution of the ecology-idea has changed, become more individualistic and narrow, less communistic and "broad." For such the present book will not be "ecology" at all, but a study of the response of plant individuals and their organs to external influences. That such response is the fundamental and penultimate basis of ecology all will agree, but that it is the superstructure and ultimate aim of the science some will doubt. But "ecologists are not agreed even as to fundamental principles and motives, indeed no one, . . . least of all the present speaker, is prepared to define or delimit ecology." Warming did not say this, nor Clements, but Henry Chandler Cowles said it as late as 1904.*

Brooklyn Botanic Garden

PROCEEDINGS OF THE CLUB

February 28, 1912

The meeting of February 28, 1912, was held in the Museum Building of the New York Botanical Garden, 4 P.M., Vice-President Barnhart presiding. Fifteen persons were present.

The minutes of the meetings of January 31 and February 13 were read and approved.

Dr. Marshall A. Howe, Secretary of the Board of Editors, presented the following proposed agreement between the Torrey Botanical Club and Columbia University:

With a view to enlarging the Library resources of the Department of Botany of Columbia University and of the Torrey Botanical Club, the following AGREEMENT BETWEEN THE TORREY BOTANICAL CLUB AND COLUMBIA UNIVERSITY WAS ENTERED INTO.

It is hereby agreed by Columbia University that it will provide for the storage of the publications of the Torrey Botanical Club; and that it will bind, catalogue and make accessible the periodicals received by it in exchange for the publications distributed in the manner below described.

It is also agreed that members of the Torrey Botanical Club

* Science II. **19**: 879. Je 1904.

shall have equal rights with members of the Columbia University in the use not only of the publications thus acquired by exchange. but of all books in the library of the Department of Botany.

The Torrey Botanical Club, on its part, agrees in consideration of the privileges thus secured and the expense thus incurred by the University to transfer to the University the Property in all publications hereafter received by the University in exchange for publications of the Club.

All details relating to exchanges, subject to the resolution of the Board of Editors of the Torrey Botanical Club, hereto attached and made part of this agreement, shall be delegated to a Committee consisting of the Librarian of Columbia University and the Librarian of the New York Botanical Garden and for this purpose said librarians are hereby made *ex-officio* members of the Club, with exemption from payment of the annual dues. This Committee shall make an annual report to the Board of Editors.

(Resolutions of the Board of Editors):

1. The surplus stock of the *Bulletin of the Torrey Botanical Club* may be used for exchanges, beginning Volume 26 (1899), provided that a minimum of 50 complete sets, beginning with this date, is reserved for sale by the Club.

2. The surplus stock of TORREYA may be used for exchanges, beginning with Volume 1 (1901) provided that a minimum of 100 complete sets is reserved for sale by the Club.

3. The surplus stock of the *Memoirs of the Torrey Botanical Club* is not to be used for exchanges.

4. All exchange publications intended for use at Columbia University are to be addressed to the Torrey Botanical Club, Columbia University. Those intended for use at the Botanical Garden are to be addressed to the Torrey Botanical Club, New York Botanical Garden.

The above agreement may be terminated at the option of either of the parties thereto on six months' notice.

On motion the agreement was unanimously adopted and the President was authorized to sign the agreement on behalf of the Club.

Dr. C. Stuart Gager was elected Delegate to represent the Torrey Club at the centenary anniversary of the Academy of Natural Sciences of Philadelphia, March nineteenth, twentieth and twenty-first.

The resignations of Miss Louise H. Seely, Edwyn Waller, Leon L. Cypress, H. Dautun and Edwin C. Bolles were read and accepted. The lecture on "Agricultural Information for City People" was postponed on account of the unavoidable absence of Prof. O. S. Morgan.

Dr. C. A. Darling of Columbia University presented a paper on "The Determination of Woods." The speaker exhibited specimens of about forty different kinds of woods and outlined a method by which the identity of a piece of wood may be determined with the aid of a hand lens.

Meeting adjourned.

B. O. DODGE, *Secretary*

MARCH 12, 1912

The meeting of March 12, 1912, was held at the American Museum of Natural History at 8:15 P.M. The meeting was called to order by Dr. Z. L. Leonard in the absence of officers of the Club. Mr. Sereno Stetson was appointed Secretary pro tem. Twenty-five persons were present.

The paper of the evening consisted of an illustrated lecture by Dr. Marshall A. Howe on "Some Floral and Scenic Features of Cuba." Lantern-slide photographs were shown illustrating characteristic Cuban plant associations, particularly in the provinces of Oriente, Camagüey, Matanzas, and Pinar del Rio. Special attention was given to the numerous native palms of the island and to the cacti of the Guantanamo Bay region. The sugar, tobacco, and fruit-growing industries of Cuba were also illustrated and commented upon.

Meeting adjourned.

SERENO STETSON, *Sec. pro tem.*

NEWS ITEMS

Professor Bruce Fink, of Miami University, Oxford, Ohio, desires to see fresh material in abundance of species of the Collemaceae collected in various parts of New York State. This group of lichens is greatly in need of careful modern taxonomic treatment and Professor Fink will devote much of his time to it during the next two years.

We learn through the daily press that the executive committee of the corporation of Brown University has decided to erect a greenhouse adjoining Maxcy Hall, as an extension of the botanical laboratory. The library has received a gift of 150 volumes of rare botanical books, valued at $2,000, in memory of the late Edward P. Taft, class of '54.

The natural history library of the University of Illinois has been enriched by the addition of a set of Flora Brasiliensis, in forty folio volumes and costing $1,500. The set is written in Latin and is said to be the fourth obtained by American libraries, others being at Harvard, Columbia and the Shaw Botanical Gardens.

Dr. J. N. Rose, who has recently been appointed research associate in the Department of Botanical Research of the Carnegie Institution, sailed for Europe on April 17, where he goes to investigate cactus collections in the various botanical gardens of England, France, Italy and Germany. He will be away about two months. His European address will be: Royal Botanic Gardens, Kew, London, England.

Dr. N. L. Britton, of the New York Botanical Garden, has returned from explorations in eastern Cuba, with more than 2,300 specimens, including many cacti and cycads.

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BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

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INDUCED HERMAPHRODISM IN ACER NEGUNDO L.

By Charles Gordon Fraser

In the sixth edition of Gray's Manual the ash-leaved maple or box elder is classified as *Negundo Aceroides* Moench., in a separate genus following the genus *Acer*. The first and one of the chief distinctions made is that the genus *Acer* is polygamo-dioecious, whereas *Negundo* is dioecious. Sargent (1905) makes the same distinction, describing *Negundo* as: "Staminate and pistillate on separate trees, . . . (stamens) none in the pistillate flower." In the seventh—and latest—edition of Gray's Manual this species is given the classification *Acer Negundo* L., but is placed in a second sub-division of the genus which is characterized as "*strictly dioecious.*" Britton (1908) classifies this form as *Acer Negundo* L., with the synonym *Negundo Aceroides* Moench., and description: "Staminate and pistillate flowers on different trees."

On May 15, 1909, the writer came across an exception to the strict dioeciousness of *A. Negundo*. By the banks of a creek near Weston, Ontario, in a grove of this species, a tree was found on one limb of which hermaphrodite flowers were borne in considerable numbers. For at least four years previous, as could readily be determined by the winter bud scars, and the *persistent pedicels*, the tree had fruited copiously, this particular limb not excepted. On the main part of the tree, which was searched carefully, only normal pistillate flowers were found. By some accident the limb in question had been partly split from the trunk, in such a way as to leave about one fifth of its bark and cambium intact. Fig. 1 shows the general appearance of the tree with the partly detached branch; fig. 2 indicates the

[No. 5, Vol. 12, of Torreya, comprising pp. 97–120, was issued 10 May 1912.]

FIG. 1. Hermaphrodism in *Acer Negundo* L.
See descriptions of figures in text.

nature and extent of the wound. In 1910 all the other branches bore fruit as usual, but this limb produced a comparatively small crop of seeds, and these of a poor quality. The winter buds in the spring of 1910 did not appear vigorous, but the writer had no opportunity of examining the flowers or the fruit during that season, nor in the spring of 1911. This winter, however, a fair crop of seed was found on the branch.

Besides having both stamens and carpels the flowers of this branch deviated from the normal types in other respects. Of these types Sargent says: "Staminate fascicled on slender hairy pedicels, 1½′–2′ long, the pistillate in narrow drooping racemes; calyx campanulate in the staminate, much smaller in the pistillate flower." Britton states that "the staminate ones are on hairy drooping pedicels, have a 5-lobed calyx, and about 5 stamens, with long pointed anthers much projecting beyond it; the pistillate flowers are in smooth or hairy drooping racemes, which greatly elongate as the fruit matures, have 5 linear oblong sepals, a slightly hairy ovary, two slender styles, and no stamens." Figs. 3 and 4 illustrate the normal male and female inflorescences respectively. In fig. 5 a hermaphrodite spray is shown from the injured branch at the same magnification as figs. 3 and 4, while the same spray appears at a higher magnification in fig. 6. The inflorescence represented in the latter figure resembles the drooping raceme of the normal carpellate more than the fascicle of the normal staminate. The structure of the flowers, moreover, is different from the two ordinary types. The calyces resemble the larger and more campanulate calyces of the staminate flowers; but in their deep lobing they are more like those of the pistillate. Finally, the normal number of stamens is given by Gray as *4–5*, by Sargent as *4–6*, and by Britton as *about 5*. The number of stamens in the flowers shown in fig. 6 varies from 0–5, the commonest numbers being 3 and 4. These hermaphrodite flowers, then, in respect to the character of the inflorescence, the structure of the calyces, and the number of the stamens, are intermediate between the normal dioecious types.

The condition described is evidently teratological, but since wounding is known in many cases to cause reversion to a more primitive type of structure,* it suggests that *Negundo* in its origin has a very close relationship to the genus *Acer*—probably a highly specialized form in this genus. In this connection the simpler, more *Acer-like* foliage of the seedling of *A. Negundo* is to be recalled. This phenomenon and the occurrence of the hermaphrodite flowers above recorded lends support to the classification which places *Negundo* in the genus *Acer*.

In conclusion I wish to express my heartiest thanks to Mr. R. B. Thomson for his interest and assistance in the preparation of this paper.

University of Toronto,

February, 1912

References

Britton, N. L., North American Trees, New York, 1908.

Sargent, C. S., Manual of the Trees of North America, Boston and New York, 1905.

THE FLORA OF NORTHAMPTON COUNTY, PENNSYLVANIA

By Wilbur L. King

(*Continued from May Torreya*)

CYPERACEAE

Cyperus flavescens L. In marshy grounds, Easton. (Porter.)

Cyperus rivularis Kunth. At Island Park. (Porter); in wet soil along canal at Bethlehem. Sept. 1, 1899.

Cyperus inflexus Muhl. In wet, sandy soil. (Porter.)

Cyperus dentatus Torr. Along canal in wet sandy soil at Bethlehem, Sept., 1898. Specimens with flower scales modified into tufts of small leaves have been found.

Cyperus rotundus L. On ore dumps in Bethlehem Steel Co.'s yard. Reported in Torrey Bulletin Jan., 1892.

Cyperus esculentus L. In wet soil and in meadows along Monocacy creek near Bethlehem. Common. Aug. 5, 1899.

Cyperus strigosus L. In moist sandy soil and in meadows at Bethlehem. Sept. 9, 1896.

Cyperus filiculmis Vahl. Along Lehigh river. (J. A. Ruth.)

Dulichium arundinaceum (L.) Britton. In moist soil at Island Park. Aug. 25, 1902.

Eleocharis ovata (Roth.) R. & S. On muddy shores of Lehigh river at Bethlehem.

Eleocharis glaucescens (Willd.) Schult. In moist soil along Lehigh canal at Bethlehem. June 20, 1899.

Eleocharis acicularis (L.) R. & S. On muddy banks of Lehigh river, Bethlehem. Aug. 22, 1899.

* In certain acacias, pines, junipers, etc., wounding causes reversion to the seedling type of foliage which is considered ancestral.

ELEOCHARIS INTERMEDIA (Muhl.) Schultes. In wet soil along Monocacy creek 1 mile east of Bethlehem. Sept. 24, 1904.

STENOPHYLLUS CAPILLARIS (L.) Britton. In dry or moist soil. (Porter.)

FIMBRISTYLIS AUTUMNALIS (L.) R. & S. In moist sandy soil along Lehigh river, Bethlehem. Aug. 22, 1899.

SCIRPUS PLANIFOLIUS Muhl. In woods, Lehigh Mt. May 13, 1899.

SCIRPUS DEBILIS Pursh. In sandy soil along Lehigh river, Bethlehem. Aug. 22, 1899.

SCIRPUS AMERICANUS Pers. In fresh water and brackish swamps. (Porter.)

SCIRPUS LACUSTRIS L. In wet sandy soil at Bethlehem. Aug. 5, 1899.

SCIRPUS ATROVIRENS Muhl. In meadows along Monocacy creek one mile from Bethlehem. July 28, 1900.

SCIRPUS CYPERINUS (L.) Kunth. In swamps or meadows. (Porter.)

ERIOPHORUM GRACILE Koch. In bogs and ponds. (Porter.)

SCLERIA PAUCIFLORA Muhl. In dry soil. (Porter.)

CAREX FOLLICULATA L. In shaded swamps and wet woods, Pen Argyl. (Porter.)

CAREX INTUMESCENS Rudge. In damp thickets and wet places. (Porter.)

CAREX LUPULINA Muhl. In swamps. (Porter.)

CAREX LURIDA Wahl. In wet places. (Porter.)

CAREX HYSTRICINA Muhl. At Easton. (Porter.) In wet meadows along Monocacy creek near Bethlehem. May 27, 1899.

CAREX COMOSA Boott. Near Easton. (Porter.) In wet soil along Monocacy creek near Bethlehem. May 30, 1899.

CAREX TRICHOCARPA Muhl. In wet places. (Porter.)

CAREX SCABRATA Schwein. In ravine on Lehigh Mt. south of Lehigh University. June 15, 1900. (J. A. Ruth.)

CAREX VESTITA Willd. In sandy woods, Pen Argyl. (Porter.)

CAREX STRICTA Lam. In swamps. (Porter.)

CAREX STRICTA ANGUSTATA (Boott.) Bailey. (Porter.)

CAREX TORTA Boott. In wet places. (Porter.)

CAREX PRASINA Wahl. In ravine, Lehigh Mt., south of Lehigh University. June 15, 1900. (J. A. Ruth.)

CAREX CRINITA Lam. In wet places. (Porter.)

CAREX GYNANDRA Schwein. In swamps, Seidersville. (Porter.)

CAREX VIRESCENS Muhl. Near Easton. (Porter.) In woods, Lehigh Mt. July 1, 1899.

CAREX COSTELLATA Britton. In woods. (Porter.)

CAREX TRICEPS Michx. In woods on Lehigh Mt. south of Lehigh University. June 15, 1900. (J. A. Ruth.)

CAREX GRACILLIMA Schwein. In moist woods. (Porter.)

CAREX DAVISII Schwein. & Torr. In moist thickets and meadows along Delaware river, Easton. (Porter.)

CAREX GRISEA Wahl. In woods and thickets, Easton. (Porter.)

CAREX GLAUCODEA Tuckerm. In open fields at Easton, Pen Argyl and Bethlehem. (Porter.)

CAREX GRANULARIS Muhl. In bogs or meadows. (Porter.)

CAREX GRANULARIS SCHRIVERI Britton. At Easton. (Porter.) This is the only county in Penna. from which this plant is reported in Porter's Flora.

CAREX CONOIDEA Schk. In meadows. At Easton. (Porter.)

CAREX OLIGOCARPA Schk. In dry woods and thickets, Chestnut Hill, Easton. (Porter.)

CAREX HITCHCOCKIANA Dewey. In woods and thickets, College Hill, Easton. (Porter.)

CAREX TETANICA Schk. In grassy meadows and wet woods. (Porter.)

CAREX LAXIFLORA Lam. In dry woods, Lehigh Mt. May 13, 1899.

CAREX LAXIFLORA PATULIFOLIA (Dewey) Carey. (Porter.)

CAREX STYLOFLEXA Buckley. In woods and thickets. (Porter.)

CAREX DIGITALIS Willd. In woods and thickets. (Porter.)

CAREX LAXICULMIS Schwein. In woods and thickets, Chestnut Hill, Easton. (Porter.)

Carex setifolia (Dewey) Britton. In dry or rocky soil, preferring limestone rocks, at Easton. (Porter.)
Carex pedicellata (Dewey) Britton. In dry soil. (Porter.)
Carex pennsylvanica Lam. On dry hillsides on Lehigh Mt.
Carex varia Muhl. On dry hillsides on Lehigh Mt. near South Bethlehem.
Carex nigro-marginata Schwein. In dry soil, Seidersvillle. (Porter.)
Carex umbellata Schk. In dry or arid soil. (Porter.)
Carex pubescens Muhl. In woods, College Hill, Easton. (Porter.)
Carex Willdenovii Schk. In dry soil or woods. (Porter.)
Carex leptalea Wahl. In wet places. (Porter.)
Carex vulpinoidea Michx. In wet soil along canal at Bethlehem and along mountain stream near Lehigh University. June 20, 1899.
Carex stipata Muhl. In wet meadows along Monocacy creek near Bethlehem. May 30, 1899.
Carex rosea Schk. Easton (Porter) ; on dry hillsides on Lehigh Mt.
Carex retroflexa Muhl. In woods. (Porter.)
Carex muricata L. On College Hill, Easton. (Porter.)
Carex sparganioides Muhl. Along roadsides, Bethlehem. May 13, 1899.
Carex cephaloidea Dewey. In dry fields and on hills. (Porter.)
Carex cephalophora Muhl. In stony thickets near Bethlehem. May 30, 1899.
Carex Muhlenbergii Schk. On summit of Lehigh Mt. in rocky soil. June 15, 1900. (J. A. Ruth.) At Easton and Seidersville. (Porter.)
Carex Muhlenbergii xalapensis (Kunth.) Britton. (Porter.)
Carex sterilis Willd. In sandy or moist soil. (Porter.)
Carex interior capillacea Bailey. At Bangor. (Porter.)
Carex canescens L. In wet places. (Porter.)
Carex bromoides Schk. In wet places. (Porter.)
Carex siccata Dewey. In dry fields and on hills, Bethlehem. (Porter.) This is the only county in the state from which it is reported in Porter's Flora.
Carex tribuloides Wahl. In meadows. (Porter.)
Carex scoparia Schk. In wet soil along canal at Bethlehem. June 20, 1899.
Carex cristatella Britton. In meadows and low thickets. (Porter.)
Carex foenea Willd. In dry woods, often on rocks. (Porter.)
Carex foenea perplexa Bailey. (Porter.)
Carex straminea Willd. In rocky ravine on Lehigh Mt. June 15, 1900. (J. A. Ruth.)
Carex festucacea Willd. In dry or moist soil. (Porter.)

ARACEAE

Arisaema triphyllum (L.) Torr. In moist woods on Lehigh Mt; along Saucon creek near Hellertown; at Walnutport. Generally distributed. May 12, 1896.
Arisaema Dracontium (L.) Schott. In moist sandy soil along Lehigh river at Bethlehem, a single specimen being found, with mature fruit. Sept. 15, 1900.
Calla palustris L. In bogs. (Porter.)
Spathyema foetida (L.) Raf. In marshy soil along Monocacy creek. Abundant. April 20, 1898.
Orontium aquaticum L. In swamps. (Porter.)
Acorus Calamus L. In wet places. (Porter.)

LEMNACEAE

Spirodela polyrhiza (L.) Schleid. In rivers and ponds. (Porter.)
Lemna trisulca L. In still or flowing water. (Porter.)
Lemna perpusilla Torr. In ponds, rivers, and springs. (Porter.)
Lemna minor L. In ponds and stagnant water. (Porter.)

COMMELINACEAE

COMMELINA NUDIFLORA L. In sandy soil along the Lehigh river at Glendon. Aug. 25, 1902.

COMMELINA COMMUNIS L. In waste places, Bethlehem.

PONTEDERIACEAE

PONTEDERIA CORDATA L. In wet soil along Lehigh river at Island Park. Aug. 25, 1901.

HETERANTHERA RENIFORMIS R. & P. In mud or shallow water. (Porter.)

HETERANTHERA DUBIA (Jacq.) MacM. In still water. (Porter.)

JUNCACEAE

JUNCUS EFFUSUS L. In moist soil along the canal at Bethlehem. June 20, 1899.

JUNCUS BUFONIUS L. Frequenting dried-up pools, borders of streams and roadsides. (Porter.)

JUNCUS TENUIS Willd. In dry sandy paths along Lehigh river, Bethlehem. July 15, 1899.

JUNCUS SECUNDUS Beauv. In fields, Bethlehem. July 10, 1899.

JUNCUS MARGINATUS Rostk. In grassy places. (Porter.)

JUNCUS NODOSUS L. (Porter.)

JUNCUS CANADENSIS J. Gay. (Porter.)

JUNCUS CANADENSIS SUBCAUDATUS Engelm. (Porter.)

JUNCUS ACUMINATUS Michx. Frequents moist soil. (Porter.)

JUNOIDES CAMPESTRE (L.) Kuntze. In wood lands. (Porter.)

MELANTHACEAE

CHAMAELIRIUM LUTEUM (L.) A. Gray. In moist meadows and thickets. (Porter.)

MELANTHIUM LATIFOLIUM Desr. In dry woods and on hills. (Porter.)

VERATRUM VIRIDE Ait. In moist ground at Wind Gap. (G. W. Caffrey.)

UVULARIA PERFOLIATA L. In moist thickets and woods on Lehigh Mt. and along canal near Bethlehem. May 17, 1897.

UVULARIA SESSILIFOLIA L. In thickets along canal one mile east of Bethlehem. May 9, 1898.

LILIACEAE

HEMEROCALLIS FULVA L. In meadows and along streams. (Porter.)

ALLIUM VINEALE L. In fields near Bethlehem. July 10, 1897.

LILIUM PHILADELPHICUM L. In dry woods. (Porter.)

LILIUM CANADENSE L. In swamps and meadows. (Porter.)

LILIUM SUPERBUM L. In meadows and marshes. (Porter.)

LILIUM TIGRINUM Andr. Escaped from cultivation along fence 3 miles north of Bethlehem.

ERYTHRONIUM AMERICANUM Ker. In moist sandy soil along towpath east of Bethlehem. April, 1896.

ORNITHOGALUM UMBELLATUM L. In meadows along Saucon Creek about one mile from its mouth. Native of Europe. June 1, 1901.

ORNITHOGALUM NUTANS L. In damp soil along canal one mile east of Bethlehem.

MUSCARI BOTRYOIDES (L.) Mill. In waste places along roadsides, Bethlehem.

CONVALLARIACEAE

ASPARAGUS OFFICINALIS L. In thickets and along fences and waste places, Bethlehem. May 30, 1899.

VAGNERA RACEMOSA (L.) Morong. In shaded places along Monocacy and Saucon creeks. May 30, 1899.

Vagnera stellata (L.) Morong. In moist soil. (Porter.)

Unifolium canadense (Desf.) Greene. Along mountain streams in moist and shady places on Lehigh Mt. near Lehigh University. Altitude 900 feet. May 30, 1900; also at Nazareth.

Polygonatum biflorum (Walt.) Ell. In woods near Bethlehem and in thickets along Saucon creek. May 17, 1897.

Polygonatum commutatum (R. & S.) Dietr. In moist woods and along streams. (Porter.)

Medeola virginiana L. In damp soil, Lehigh Mt., vicinity of Lehigh University. June, 1901.

Trillium cernuum L. In rich woods. (Porter.)

SMILACEAE

Smilax herbacea L. In woods and thickets on Lehigh Mt.

Smilax glauca Walt. In dry sandy soil. (Porter.)

Smilax hispida Muhl. In thickets. (Porter.)

Smilax rotundifolia L. In woods and thickets. (Porter.)

AMARYLLIDACEAE

Hypoxis hirsuta (L.) Coville. In dry soil on Lehigh Mt. May 30, 1897.

Narcissus Pseudo-Narcissus L. Escaped from cultivation. (Porter.)

DIOSCOREACEAE

Dioscorea villosa L. Along Lehigh river in moist soil at Bethlehem.

IRIDACEAE

Iris versicolor L. Along Monocacy creek in thickets.

Gemmingia chinensis (L.) Kuntze. On hills and along roadsides. (Porter.)

Sisyrinchium graminoides Bicknell. In grassy places, sometimes in woods. (Porter.)

Sisyrinchium angustifolium Mill. On grassy hillsides, Lehigh Mt., near South Bethlehem; altitude 900 feet. May 30, 1900.

ORCHIDACEAE

Cypripedium acaule Ait. In woods and thickets, Lehigh Mt., near South Bethlehem. May 15, 1896.

Cypripedium hirsutum Mill. In woods on Bougher Hill, Williams Township. (J. A. Ruth.)

Cypripedium parviflorum Salisb. In rich woods and thickets. (Porter.)

Orchis spectabilis L. In rich woods. (Porter.)

Habenaria bracteata (Willd.) R. Br. In woods and meadows. (Porter.)

Habenaria ciliaris (L.) R. Br. In meadows. (Porter.)

Habenaria grandiflora (Bigel.) Torr. In rich woods and meadows. (Porter.)

Pogonia ophioglossoides (L.) Ker. In meadows and swamps. (Porter.)

Pogonia trianthophora (Sw.) R.S.P. In rich woods. (Porter.)

Gyrostachys plantaginea (Raf.) Britton. Moist banks and woods. (Porter.)

Gyrostachys cernua (L.) Kuntze. In moist ground on Lehigh Mt. in vicinity of Lehigh University. (G. W. Caffrey.)

Gyrostachys gracilis (Bigel) Kuntze. In dry, open fields and open woods. (Porter.)

Peramium pubescens (Willd.) MacM. In dry woods. (Porter.)

Leptorchis liliifolia (L.) Kuntze. In moist shady grounds, Lehigh Mt. May 30, 1900.

Corallorhiza odontorhiza (Willd.) Nutt. In woods. (Porter.)

Corallorhiza multiflora Nutt. In woods. (Porter.)

Limodorum tuberosum L. In bogs and meadows. (Porter.)

JUGLANDACEAE

JUGLANS NIGRA L. On rocky hillsides, Lehigh Mt.; along the Monocacy creek in meadow land.
JUGLANS CINEREA L. In rocky soil, Lehigh Mt.
HICORIA MINIMA (Marsh.) Britton. In moist woods and swamps. (Porter.)
HICORA OVATA (Mill.) Britton. In rich soil. (Porter.)
HICORA ALBA (L.) Britton. In rich soil. (Porter.)
HICORIA MICROCARPA (Nutt.) Britton. In rich woods. (Porter.)
HICORIA GLABRA (Mill.) Britton. In dry soil along Monocacy Creek near Bethlehem.

MYRICACEAE

COMPTONIA PEREGRINA (L.) Coulter. On hillsides, Lehigh Mt., near South Bethlehem. In dry woods in Williams Township. In fruit July 1, 1899.

SALICACEAE

POPULUS ALBA L. In cemetery and yards at Bethlehem. March 18, 1898.
POPULUS BALSAMIFERA L. In moist soil along Lehigh river, Bethlehem; on dry rocky soil three miles north of Bethlehem. July 15, 1899.
POPULUS BALSAMIFERA CANDICANS (Ait.) A. Gray. In woods and fields. (Porter.)
POPULUS GRANDIDENTATA Michx. In rich woods. (Porter.)
POPULUS TREMULOIDES Michx. In dry or moist soil. (Porter.)
SALIX NIGRA Marsh. Along streams and lakes. (Porter.)
SALIX LUCIDA Muhl. In swamps and along streams. (Porter.)
SALIX FRAGILIS L. Escaped from cultivation. (Porter.)
SALIX ALBA L. In moist soil along the Lehigh river.
SALIX BABYLONICA L. In moist soil along Monocacy creek.
SALIX PURPUREA L. Sparingly escaped from cultivation. (Porter.)
SALIX FLUVIATILIS Nutt. Along streams and lakes. (Porter.)
SALIX BEBBIANA Sarg. In dry soil along streams. (Porter.)
SALIX HUMILIS Marsh. In dry soil. (Porter.)
SALIX SERICEA Marsh. In swamps and along streams. (Porter.)
SALIX VIMINALIS L. In wet soil along Lehigh River at Island Park.
SALIX CORDATA Muhl. In wet soil. (Porter.)

BETULACEAE

CARPINUS CAROLINIANA Walt. In moist woods and along streams. (Porter.)
OSTRYA VIRGINIANA (Mill.) Willd. In dry woods. (Porter.)
CORYLUS AMERICANA Walt. In thickets in Williams Township. July 28, 1900.
CORYLUS ROSTRATA Ait. In thickets, in dry soil at Wind Gap.
BETULA POPULIFOLIA Marsh. In moist or dry soil. (Porter.)
BETULA NIGRA L. Along Lehigh river at Bethlehem. May 1, 1898.
BETULA LENTA L. On hillsides on rocky soil on Lehigh Mt. near Bethlehem; also in Williams Township. April 29, 1902. Fruit June 25, 1902.
ALNUS INCANA (L.) Willd. In wet soil. (Porter.)
ALNUS RUGOSA (DuRoi.) K. Koch. In sandy soil along Lehigh river, Bethlehem. April, 1900.
ALNUS GLUTINOSA (L.) Medic. In wet places. (Porter.)

FAGACEAE

FAGUS AMERICANA Sweet. In woods, Lehigh Mt.
CASTANEA DENTATA (Marsh.) Borkh. General throughout the county in rich soil. June 25, 1898.
QUERCUS RUBRA L. In dry soil, Bethlehem.
QUERCUS PALUSTRIS DuRoi. Along towpath one mile east of Bethlehem. In fruit Oct. 1, 1900.

QUERCUS COCCINEA Wang. In dry soil. (Porter.)
QUERCUS VELUTINA Lam. In woods near Fountain Hill. (J. A. Ruth.)
QUERCUS NANA (Marsh.) Sarg. In sandy or rocky soil. (Porter.)
QUERCUS MARYLANDICA Muench. In dry soil. (Porter.)
QUERCUS ALBA L. In woods near South Bethlehem. (J. A. Ruth.)
QUERCUS MINOR (Marsh.) Sarg. In dry soil. (Porter.)
QUERCUS MACROCARPA Michx. In rich soil. (Porter.)
QUERCUS PLATANOIDES (Lam.) Sudw. In moist or swampy soil. (Porter.)
QUERCUS PRINUS L. In dry soil. (Porter.)
QUERCUS ACUMINATA (Michx.) Sarg. In dry soil. Bethlehem.
QUERCUS PRINOIDES Willd. In dry or sandy soil. (Porter.)

ULMACEAE

ULMUS AMERICANA L. In moist soil. (Porter.) Along Lehigh river east of Bethlehem.
ULMUS CAMPESTRIS L. Adventive or naturalized from Europe on Bushkill creek. (Porter.)
ULMUS FULVA Michx. In dry rocky soil along Monocacy Creek.
CELTIS OCCIDENTALIS L. In dry rocky soil along Monocacy and Saucon creeks and Lehigh river. May 6, 1900.
CELTIS CRASSIFOLIA Lam. (Porter.)

MORACEAE

MORUS RUBRA L. In dry soil along the canal east of Bethlehem. May 20, 1900.
MORUS ALBA L. In fields and hillsides, Bethlehem. May 18, 1899.
HUMULUS LUPULUS L. In thickets and hedges near Bethlehem. July 22, 1899.
CANNABIS SATIVA L. In waste places and along roadsides, South Bethlehem.

URTICACEAE

URTICA DIOICA L. In waste places, Bethlehem.
URTICA GRACILIS Ait. In waste places, Bethlehem. (J. A. Ruth.)
URTICASTRUM DIVARICATUM (L.) Kuntze. In woods near South Bethlehem. (J. A. Ruth.)
ADICEA PUMILA (L.) Raf. In moist wet places. (Porter.)
BOEHMERIA CYLINDRICA (L.) Willd. In moist ground along Lehigh River. July 15, 1899.
BOEHMERIA CYLINDRICA SCABRA Porter. (Porter.)

SANTALACEAE

COMANDRA UMBELLATA (L.) Nutt. In dry fields and thickets. (Porter.)

ARISTOLOCHIACEAE

ASARUM CANADENSE L. In rich soil in thickets along canal one mile east of Bethlehem; along Saucon creek. June 1, 1901.
ASARUM REFLEXUM Bicknell. In rich soil along streams. (Porter.)
ARISTOLOCHIA SERPENTARIA L. In rich woods in Williams Township.

POLYGONACEAE

RUMEX ACETOSELLA L. In dry fields. Common. May 6, 1897.
RUMEX PATIENTIA L. In dry fields at Bethlehem. June 5, 1897.
RUMEX CRISPUS L. In waste places at Bethlehem. (J. A. Ruth.)
RUMEX OBTUSIFOLIUS L. In waste places, South Bethlehem. Oct. 30, 1897.
FAGOPYRUM FAGOPYRUM (L.) Karst. In waste places and along railroad tracks, Bethlehem.
POLYGONUM AMPHIBIUM L. In ponds and lakes. (Porter.)

POLYGONUM EMERSUM (Michx.) Britton. In swamps or moist soil. (Porter.)
POLYGONUM INCARNATUM Ell. In wet soil. (Porter.)
POLYGONUM PENNSYLVANICUM L. In waste places near Bethlehem. Sept. 17, 1895.
POLYGONUM PERSICARIA L. In waste places. (Porter.)
POLYGONUM HYDROPIPEROIDES Michx. In swamps or wet soil. (Porter.)
POLYGONUM HYDROPIPER L. In waste places about Bethlehem. (J. A. Ruth.)
POLYGONUM PUNCTATUM Ell. In wet, sandy soil, Bethlehem. Aug. 5, 1899.
POLYGONUM ORIENTALE L. In waste places, Bethlehem; along canal near Glendon.
POLYGONUM VIRGINIANUM L. In thickets along towpath near Bethlehem.
POLYGONUM AVICULARE L. Common in waste places, Bethlehem. Sept. 4, 1899.
POLYGONUM LITTORALE Link. On shores and in waste places. (Porter.)
POLYGONUM ERECTUM L. In moist or dry soil. (Porter.)
POLYGONUM TENUE Michx. In dry soil. (Porter.)
POLYGONUM CONVOLVULUS L. In waste or cultivated grounds. (Porter.)
POLYGONUM CILINODE Michx. In rocky places. On both sides of Delaware river at Easton. (Porter.)
POLYGONUM SCANDENS L. In thickets and waste places, Bethlehem. July 22, 1899.
POLYGONUM SAGITTATUM L. In moist ground along Monocacy creek, one mile from Bethlehem. Aug. 12, 1899.
POLYGONUM ARIFOLIUM L. In marshy ground along Monocacy Creek near Bethlehem.
POLYGONUM HERNARIOIDES Del. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.

CHENOPODIACEAE

CHENOPODIUM ALBUM L. Common in waste places, Bethlehem.
CHENOPODIUM VIRIDE L. In waste places, Bethlehem.
CHENOPODIUM GLAUCUM L. Along streets of Easton. (Porter.) Along P. & R. R. R. tracks, South Bethlehem. July 22, 1899.
CHENOPODIUM BOSCIANUM Moq. In woods and thickets, Easton. (Porter.)
CHENOPODIUM MURALE L. In waste places. (Porter.)
CHENOPODIUM HYBRIDUM L. In woods and sometimes in waste places. (Porter.)
CHENOPODIUM BONUS-HENRICUS L. In waste places and in moist soil along Monocacy creek, Bethlehem. Aug. 12, 1899.
CHENOPODIUM BOTRYS L. Along towpath, Bethlehem. Aug. 5, 1899.
CHENOPODIUM AMBROSIOIDES L. In waste places, Bethlehem. (J. A. Ruth.)
ROUBIEVA MULTIFIDA (L.) Moq. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Torrey Bulletin Jan., 1892.
BLITUM CAPITATUM L. In dry soil. (Porter.)
ATRIPLEX HASTATA L. Along the railroads near Bethlehem. (E. A. Rau in Bull. Torrey Club Oct., 1881.)

AMARANTHACEAE

AMARANTHUS HYBRIDUS L. In waste places and along roadsides, Bethlehem. Sept. 15, 1900.
AMARANTHUS HYBRIDUS PANICULATUS (L.) Uline. & Bray. In waste grounds, Bethlehem.
AMARANTHUS GRAECIZANS L. In ballast along railroads, Bethlehem. Sept. 3, 1899; in waste places, Glendon.
AMARANTHUS DEFLEXUS L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.
AMARANTHUS BLITUM L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.

PHYTOLACCACEAE

PHYTOLACCA DECANDRA L. In moist soil along Saucon creek; in hedges and thickets, Bethlehem. July 10, 1899.

AIZOACEAE

MOLLUGO VERTICILLATA L. In waste places, Bethlehem. Aug. 16, 1900.

PORTULACACEAE

CLAYTONIA VIRGINICA L. In moist thickets along Lehigh canal two miles east of Bethlehem. May 2, 1896.
PORTULACA OLERACEA L. In waste places and along roadsides, Bethlehem.
PORTULACA GRANDIFLORA Hook. Occasionally escaped from cultivation and in waste places.

CARYOPHYLLACEAE

AGROSTEMMA GITHAGO L. Generally distributed in grain fields. Ascends on Lehigh Mt. to 940 feet. May 12, 1896.
SILENE STELLATA (L.) Ait. In woods. (Porter.)
SILENE VULGARIS (Moench.) Garcke. In meadows and waste places. (Porter.)
SILENE VIRGINICA L. In rocky woods in Allen township. June 3, 1901.
SILENE CAROLINIANA Walt. In dry or rocky soil. (Porter.)
SILENE ANTIRRHINA L. In fields and waste places, Bethlehem. June 20, 1899.
SILENE ARMERIA L. Occasionally in waste places, Bethlehem.
SILENE NOCTIFLORA L. In waste places, Bethlehem.
SILENE ANGLICA L. In waste places. (Porter.)
LYCHNIS ALBA Mill. In waste places, Bethlehem.
SAPONARIA OFFICINALIS L. In waste places, Bethlehem; also in Allen township. July 13, 1898.
VACCARIA VACCARIA (L.) Britton. Along L. V. R. R. track, Bethlehem.
DIANTHUS ARMERIA L. In fields and along roadsides. (Porter.)
ALSINE ULIGINOSA (Murr.) Britton. In cold brooks and springs. (Porter.)
ALSINE MEDIA L. In gardens, lawns, and waste places, Bethlehem. Common. May 6, 1900.
ALSINE LONGIFOLIA (Muhl.) Britton. In moist grounds along Lehigh canal one mile east of Bethlehem. June 3, 1899.
ALSINE GRAMINEA (L.) Britton. In fields and waste places. Aug., 1898.
CERASTIUM VISCOSUM L. In waste places, Bethlehem. (J. A. Ruth.)
CERASTIUM SEMIDECANDRUM L. In dry soil on Lehigh Mt. June 12, 1897.
CERASTIUM VULGATUM L. In thickets along roadsides, Bethlehem. May 30, 1899.
CERASTIUM LONGIPEDUNCULATUM Muhl. In moist shaded places. (Porter.)
CERASTIUM ARVENSE L. In dry, rocky places. (Porter.)
SAGINA PROCUMBENS L. In streets, Bath. (Porter.)
ARENARIA SERPYLLIFOLIA L. In fields and cemeteries, Bethlehem. May 20, 1900.
ARENARIA STRICTA Michx. In dry, rocky places. (Porter.)
ANYCHIA DICHTOMA Michx. In woods on Lehigh Mt.
ANYCHIA CANADENSIS (L.) B.S.P. In dry woods two miles east of Bethlehem. July 22, 1911.
SCLERANTHUS ANNUUS L. In fields and waste places. (Porter.)

NYMPHAEACEAE

BRASENIA PURPUREA (Michx.) Casp. In ponds and slow streams. (Porter.)
NYMPHAEA ADVENA Soland. In Lehigh river at Calypso Island, Bethlehem, and at Freemansburg. Aug. 25, 1901.
CASTALIA ODORATA (Dryand.) Woodv. & Wood. In Lehigh river at Island Park. Aug. 25, 1901.

(*To be continued*)

REVIEWS

Payne's Manual of Experimental Botany

This manual is conceived in an excellent spirit, and its purpose, as stated in the preface, is "to teach botany by experiment." The publisher's announcement describes it as "a laboratory manual for a complete high school course, in which botany is continually correlated with practical gardening, farming, and bacteriology." In this continuous correlation lies what the reviewer considers one of the main weaknesses of the book. Undoubtedly the movement to introduce the study of the principles of agriculture into secondary schools is a movement in the right direction, but why agricultural matter should be eternally mixed in with botany until the latter science loses all semblance of its real self, it is difficult to comprehend. To read (p. 45 et seq.) directions for a high school pupil, *as part of a course in experimental botany* (!) to "visit a farm," and "describe a plow" and tell how it is used; to investigate the economic problem of "why truck farms abound near cities"; to "visit a wheat field at harvest time and observe the process [what process is not stated] at each step"; to investigate "the way in which the various small fruits and vegetables are gathered and prepared for marketing"; to "visit a commission merchant's place of business *at any season*" and "make a list of the products *by season*" (*sic*); to describe the process of milling; to "visit a sawmill and see how logs are reduced to various kinds of lumber"; to read this in what professes to be a text book of botany, leaves no room for doubt that it is high time to call a halt in the emasculation of high school botany. Let us teach agriculture, by all means, in the proper time and place, but let us not confuse and deceive the pupil by making him think that plowing and milling and market gardening are a part of the science of botany, any more than the daily work of the butcher has anything to do with the science of zoölogy.

To follow the author through the book requires several new adjustments of ideas. Thus the first exercise on page 49, to

* Payne, Frank Owen.—Manual of Experimental Botany, pp. 1–272, figs. 117. New York. American Book Company. 1912.

find out, by observation, the parts of a seed, can by no strain of words be called an experiment, and the wisdom of the author's plan, as stated in the Preface (p. 3), "to present the morphological part also in the form of experiments," may be regarded as questionable from a pedagogical standpoint, as tending to give the pupil a quite erroneous notion of what an experiment really is. To call seeds, water, leaves, *et cetera* "apparatus," seems really unfortunate, for the pupil will surely have to abandon this notion entirely if he continues scientific studies in more advanced grades. Incidentally, this material is omitted in the list of required apparatus on page 270.

On page 38 mineral nutrients are erroneously called "plant foods," and the definition on page 52, "An embryo is an immature or undeveloped plant or animal," would include boys and saplings. On page 58, in an experiment "*To find how to make the embryo plant begin to grow,*" the pupil is directed to plant seeds in sawdust in three tumblers, one of which is not watered, the second kept moist, and the third saturated by having the tumbler filled with water. The next direction is to place the tumblers where the seeds in all three will have the same amount of air (!) and heat. As the "conclusion," the pupil is directed to "state the effect of water on germination as shown by the experiment." The appended suggestion is for the pupil to visit a malt house and test the malt for starch and grape sugar, and then the question of water supply is again taken up. The "reference work" in connection with the subject of "heliotropism" (p. 101) is to "find out how beet sugar is obtained, tracing the process from seedtime to the manufactured product." On page 109 it is implied that the conclusion and the result of an experiment are synonymous. On pages 70–71, the heading of the work dealing with the retardation of growth by the removal of cotyledons from a germinating seed is "Effect of mutilation," though the pupil is led to question the true significance of his experiment in a "query"; so also in connection with root-hairs, on page 104. It is implied on page 78 that, owing to diminished water supply, desert plants are of small stature, thus ignoring the existence of such large desert plants as the giant cactus. But such inaccuracies are too numerous to mention: *e. g.*, node for internode (probably) on page 112, growing point synonymous with plumule (p. 114), object of experiment stated quantitatively and the experiment carried through qualitatively (pp. 130–131), further experimentation assigned as "reference work" (p. 137), "leaves exert an upward pull"! (p. 151), the implication that government encouragement of tree planting in the western states is closely correlated with transpiration (p.156), the implication that the release of oxygen in photosynthesis accounts for the greater "purity" of country air over city air (pp. 165–166), the definition of pollination as the reception of pollen *by the ovules* (p. 187), the implication that Jack-in-the-pulpit is the same as Skunk Cabbage (cf. "Jack-in-the-pulpit or Skunk Cabbage"—p. 206, with "Toadflax or Butter and Eggs"—p. 212), and so on.

On page 153, the old method of shielding a portion of a leaf from light by corks, long since shown to be fallacious by both King and Ganong, is retained, and the object of this experiment in starch-making is stated in the indefinite way, "To discover the effect of light upon foliage."

But there are also good points about the book. The device on page 59 for exposing germinating seeds to differential water supply, the experiment (p. 87) to show, by using eosin and methyl green, that the path of liquid up in a parsnip root is different from the path of the liquid down, and many of the illustrations—notably figures 47, 59, 98, and 115, are excellent.

The reviewer feels that it is unfortunate for the author and for high school pupils and teachers that the manuscript was not submitted by both author and publisher to some competent botanist or university teacher before being printed. As is usual with this publishing house, the date of publication is nowhere given, and the reviewer regards this as a serious defect, especially in a text book on any science. The press work and binding are excellent, but think of omitting an index in the year of our Lord one thousand nine hundred and twelve!

C. Stuart Gager

CURRENT LITERATURE

In the *Educational Review* for November Professor H. M. Richards, of Barnard College, discusses Botany in the College Course. Since lack of space prevents reprinting the entire article, the following brief notes are presented. After mentioning the early emphasis on classification and terminology and the present common idea that "there is nothing of general importance or of compelling interest in the study of plants," Professor Richards points out that "the pendulum has, perhaps, swung a little too far away from what has been called the "knowing of plants." So much so that students sometimes complain that their "course in botany has not given them enough opportunity to learn the names of plants, thus placing the less experienced teacher in somewhat of a quandary as to whether it be better that the student be instructed in the fundamental principles of plant structure and behavior or that he simply be enabled to name the individual plants which may be seen in his walks abroad. There is, however, no doubt as to which is preferable from the standpoint of training and general education, and botanical teachers are to-day universally agreed that it is the principles which should be taught as affording the student a comprehensive outlook over a branch of knowledge which is in reality of the first importance to the human race. Ability to name the flowers is an interesting accomplishment for the amateur, but as a mere avocation it is not a pursuit which in itself often leads to any great intellectual advance for the student, and may degenerate into an occupation scarcely of more intrinsic value than the collecting of postage stamps."

This paper, however, was written to show what botany is capable of as a means of scientific discipline. "For the very reason that botany is no longer merely the study of gross morphology largely expressed in terms of classification, there is less ease than there used to be in delimiting it sharply from other sciences,—not the least indeed of its advantages, educationally speaking. Formerly there was commonly understood to be a fairly clear distinction between the exact experimental sciences, like physics and chemistry, and the purely observational ones like botany and zoölogy, at least as they were taught. Now, however, the great increase in the development of the experimental side, which in its last analysis leads to the provinces of chemistry and physics, makes botany for instructional purposes, as well as for itself, a science in which pure observation is greatly tempered by experiment. Such a combination is a peculiarly fortunate one, and it is just here that botany presents practical educational advantages over almost any other science. We have, then, the possibility of training students in direct observation from natural objects in conjunction with observation of experimental phenomena from which conclusions may be drawn more or less indirectly."

Important also is the ability to see things as they are without prejudgment or prejudice. While the value is the same in training in any kind of clear thinking, *e. g.*, mathematics or botany, the laboratory makes its own addition to the value of a science like botany. There the student comes in actual contact with the living material. "He learns in the beginning that each line that he draws has its meaning and that no careless slipshod sketch can represent with accuracy the object before him. He then further finds that sins of omission are equally fatal to accurate representation as sins of commission. He must recognize the naked truth. It is not the question of his own or any one else's opinion whether a certain appearance is or is not as he thinks he has observed it, but it is a question of fact, and he is forced to appeal to the object itself for his answer. Another point of advantage is the segregation of the student in the laboratory, since he is thereby forced to do his own work and his own thinking. It is the fault of the instructor if he is helped too much or is allowed to be prejudiced by drawings or descriptions of the objects studied. It was this spirit which imbued the teaching of the elder Agassiz, and which, in a modified form, is still recognized as an important principle of the best instruction. Of course, like all things good in themselves, the practice of making the student work for himself can be overdone, for it is impossible for the ontogeny of the mental development of an individual to recapitulate *in toto* the phylogeny of the development of a science. And if it were not impossible, certainly it would be absurd. It is for the instructor to make sure that the student does not waste his time and energy in floundering among problems that his experience could not enable him to solve, and at the same time to bear in mind that it is not simply information which the student needs. Even the best scholar will think he sees what he is told to see, be his instructor a book or a person, and if informed before he has made an attempt to investigate for himself, he gains no power to overcome difficulties in observation. In other words, it is the increase in power of a previously untrained faculty which makes this instruction, if properly carried out, profitable in the broadest sense. It is not to be supposed that the particular observational problems presented to him in the laboratory will ever face the individual in the outside world; in all probability they will not; but the necessity of independent observation and of drawing conclusions therefrom certainly may face him, and he can meet them more successfully if his mind and his eye are habituated to work coördinately. Preëminently in the laboratory is this training afforded; a slow process, perhaps, and an expensive one, too, educationally considered, but more than worth the cost both in time and energy."

Such work "resolves itself fundamentally into seeing things as they are, interpreting the observations by the simplest processes of clear thinking, and finally recording both the object itself and the conclusions drawn from it, with strict honesty. The net result is clear seeing, clear thinking, and a clear conscience." Emphasizing the common sense fact that the problems should be carefully chosen, lying within the range of possible interest yet never narrowed into a tiresome repetition of endeavor, the author passes to a "lesser though entirely legitimate purpose, namely, the increasing of the pleasurable appreciation of the things of the world, and consequently the enlargement of the ability for rational enjoyment of life." The stimulus botany offers to the imagination, "one of the most valuable assets of an individual in determining his success for himself and his value to the community."

In a college course the sub-divisions of botany have various undisputed utilitarian values from the informational view point. The contribution of botany to medicine lies not only in its relation to bacteriology, but in the suggestive field of plant physiology. Recognizing that a certain amount of botanical fact must of course be presented in one way or another to the student, the author insists that the "relation of the science to other fields of knowledge should be accentuated, whether it be to the obviously allied one of zoölogy or to the more remote one of economics, for the ramifications of a subject like botany are so many and so far-reaching that it touches upon many lines."

After indicating appropriate types of work for the several college years, the author closes with the opinion that "in both a purely pedagogical and informational sense, botany and zoölogy rank equally with physics and chemistry in suitability for a required science option in the college course."—J. B.

The American Breeder's Magazine, vol. II, no. 3, contains a syllabus of "Suggestive Laboratory Exercises for a Course in Plant Breeding," prepared by Prof. Arthur Gilbert of the Laboratory of Experimental Plant Breeding at Cornell University.

Twenty-five exercises are submitted covering such studies as: variations in common plants; morphology of flowers; technique and practice in cross pollination; behavior of hybrids of oats, wheat and citrus; critical examination of cytological preparations showing nuclear division, chromosomes, pollen mother cells, etc., and special consideration of corn as to behavior of hybrids, xenia, correlation of characters, judging and ear to row tests.

The appearance of this outline is timely. Plant Breeding is destined to take an important place in botanical instruction. The arrangement of an adequate course of laboratory instruction in this subject presents more complications than do most biological branches.

The exercises as presented are of special interest as they come from a laboratory which has been a pioneer in teaching the subject of Plant Breeding.—A. B. S.

The Toxicity of Certain Mushrooms of the Genus *Amanita* is a short but important paper by Radais and Sartory in the *Rev. Scien. du Bourbonnais*, etc., **24**: 97–8. In view of the serious aspect of mushroom poisoning this last fall in our vicinity this warning seems to be applicable here as well as in Europe. During the week of September 9, 1911, at least *twenty-two* persons lost their lives and many more were made seriously ill by mushrooms in the vicinity of New York. A translation of this French article follows.

"The autumn of 1911 has brought the usual outbreak of mushroom poisoning, with many fatal cases, caused primarily by eating *Amanita phalloides* Fr. The press considered that it was doing a useful thing in spreading among the people, with the authority of naturalists whose intentions were more laudable than their knowledge, the incorrect and dangerous notion that in treating the mushrooms with boiling water followed by repeated washing in cold water, all danger in eating them had been removed. For a long time mycologists have recognized that this treatment will often remove certain very soluble bitter and poisonous principles but they have never ceased to put people on their guard against the inefficiency of this method in the case of certain species, especially *Amanita phalloides*. The present seems to be an opportune time to confirm this caution with experiments. Our observations were made upon several poisonous species but with special reference to *A. phalloides*. We may sum up the results of our experiments in the following words: *A. phalloides* still preserves its toxic principle unchanged after being heated to boiling for some time; in the dried state its toxicity is not weakened after standing a year nor has it lost its poisonous properties after remaining dry for six years; the poison is still held in the tissues of the mushroom after boiling with water.

"*Therefore it is very unwise to spread broadcast the erroneous idea that all poisonous mushrooms may be rendered harmless by boiling with water and then washing repeatedly in cold water.*" —E. D. C.

Engelmann, Wilhelm: Jubiläums Katalog der Verlagsbuchhandlung Wilhelm Engelmann in Leipzig, 1911, pages 447. This beautiful example of the printer's art gives photographic reproductions of letters to the firm, buildings and members of the firm from 1811 to 1911. It is mainly interesting to the botanist because the Wilhelm Engelmann establishment has been instrumental in the printing of numerous botanical works beginning with Grisebach and ending with Engler. Wilhelm Engelmann is the publisher of "Die natürlichen Pflanzenfamilien," "Die Vegetation der Erde" and "Das Pflanzenreich." The Jubiläums Katalog gives a complete statement of the contents of all these works and thus becomes of value to bibliographers. It commemorates the centenary of this German publishing house.—John W. Harshberger.

A portrait of Charles Mason Hovey with a short sketch of his life has appeared in a recent number of The American Breeders Magazine (vol. II, no. 3). Special mention is made of his important contribution to horticulture in developing the first pistillate strawberry placed upon the market in America and from which practically all the present commercial varieties were derived, and of his success as an editor, author, plant breeder, nurseryman and merchant. He was born in Massachusetts in 1810 and lived in his native state until his death in 1887.—A. B. S.

A new text-book of microbiology,* such as the present one, is a useful compendium consisting of chapters written by a number of specialists, who have, under the editorial supervision of Charles E. Marshall, provided the fundamental and guiding principles which are basic to an interpretation of such subjects as air impurities, water supplies, sewage disposal, soils, dairying, fermentation industries, food preservation and decomposition, manufacture of biological products, transmission of disease, susceptibility and immunity, sanitation, and control of infectious or contagious diseases.

* *Marshall, Charles E.* (Editor), and other Contributors:—Microbiology for Agricultural and Domestic Science Students. (Pages i–xxi + 1–724. Philadelphia. P. Blakiston's Son & Co.)

The plan of a text-book in microbiology, which seeks to furnish basic principles, must assume a definite and systematic arrangement. With this in view, the text, amply illustrated with figures, has been divided into three parts: Morphological and Cultural, or that which deals with lower forms of life and methods of handling; Physiological, or that which deals strictly with functions; Applied, or that which reaches into the application of the facts developed to the problems met in the study of professional or practical affairs of agriculture, or domestic science.—JOHN W. HARSHBERGER.

NEWS ITEMS

We learn from *Science* that under the auspices of the Geographical Society of Philadelphia, a botanic and geographic expedition is to be made this summer to southern Florida by Professor John W. Harshberger, of the University of Pennsylvania. Professor Harshberger has made two previous trips to Florida and this expedition is to complete his studies in the Everglades region of the extreme southern part of the peninsula. The itinerary will be approximately as follows: Making Fort Meyers on the west coast headquarters, Professor Harshberger will first investigate the region in that vicinity; visits will be made to several of the islands along the gulf coast; the Caloosahatche will be ascended by power boat to Lake Okeechobee and the flora of that inland lake will be studied. Then the attempt will be made (if the drainage canal has been sufficiently constructed) to cross the Everglades to Fort Lauderdale on the east coast. As no botanical geographer has ever crossed the Everglades, unusual opportunities will be presented to study a region of great scientific interest. Photographs will be taken of the vegetation, the region will be mapped botanically, and a collection of the more interesting plants will be made. An abstract of the results of this expedition will be published in the October number of the *Bulletin* of the Geographical Society of Philadelphia.

The United States Forest Service has prepared a traveling exhibit of photographs for circulation among schools and libraries. It is sent free of expense, except of course transportation charges (weight 15 pounds). The exhibit consists of 44 pictures, arranged in sets of four, for such topics as forest fires, lumbering, forests and water supply, and how the national forests are used. Applications should be made directly to the Forester, Washington, D. C.

Professor Josephine E. Tilden, of the University of Minnesota, has been given leave of absence on half salary, for the coming year, to carry on botanical research in the Islands of Tahiti and New Zealand.

We learn from *Science* (31 May) that Dr. B. M. Duggar, of Cornell University, has been elected to fill the professorship of plant physiology and applied botany in Washington University, St. Louis.

Professor F. O. Grover, head of the department of botany in Oberlin College, has been appointed by the faculty to represent the college in the Ohio Biological Survey.

At the University of Pennsylvania Guy E. Albert, of York Springs, and John Y. Pennypacker, of Philadelphia, have both received university scholarships in botany.

The following botanists have been elected to the fraternity of Sigma Xi at Columbia University: C. A. Darling, B. O. Dodge, R. C. Benedict, and W. S. Cameron.

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TORREYA

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BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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THE DIVERSE HABITATS OF THE EASTERN RED CEDAR AND THEIR INTERPRETATION

BY ROLAND M. HARPER

The red cedar of Eastern North America, *Juniperus virginiana* L.* (also called in some recent books *Sabina virginiana*) is noteworthy for the variety of habitats in which it is found; and some writers have regarded it as almost indifferent to environmental conditions.

On the coast of Long Island, Georgia, northeastern Florida, and no doubt at many intermediate points, *Juniperus* grows on the borders of salt and brackish marshes, and in Georgia—perhaps not so much farther north—it is frequent on low sandy islands in the marshes. It is said to grow on dunes on the shores of Lakes Michigan and Erie, and at many places on the Atlantic coast. In West Florida and perhaps elsewhere it is found in the estuarine swamps of muddy rivers. In Middle Georgia, particularly in DeKalb, Rockdale and Columbia Counties, it is frequent, though not abundant, on flat almost bare exposures of granite; and in Alabama and several other states it can be

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* The cedars of central Texas, the Rocky Mountain region and farther west, formerly referred to this species, have been separated by various authorities in recent years, probably with good reason. At the same time those of Florida and neighboring parts of other states have been referred to a West Indian species, *J. Barbadensis* L. But the alleged differences between the northern and southern cedars seem to be no greater than many other trees exhibit in different habitats, and no one has ever succeeded in drawing a sharp line between them on the map. If the Florida cedar was really identical with a West Indian one we would naturally expect to find it in the extreme southern part of the state, like many other tropical trees; but no *Juniperus* seems to have been reported south of Brevard County on the east coast and Manatee on the west. Just what the relationship is between our cedar and those of Bermuda and the Bahamas does not concern the present paper.

seen on sandstone cliffs of various ages, from pre-Cambrian to Carboniferous.

The headquarters of our cedar seem to be in the interior hardwood region of Eastern North America,* from southern Ontario to northern Alabama. There, from all accounts, it was very abundant in the pioneer days, especially on bare limestone rocks, forming the great cedar-glades of Middle Tennessee and adjacent territory, which have been mentioned by many observers (though strange to say no illustrations of them seem to have yet found their way into botanical or geographical literature).

In addition to its natural habitats (of which those already mentioned do not exhaust the list), in southern New England, adjacent New York, and many other places the cedar is most commonly seen scattered in dry pastures and abandoned fields; and in nearly all parts of its range, particularly in the Piedmont region of Virginia, it is a familiar feature of roadsides and fence-rows. It is so common in such artificial or unnatural situations that it would be a difficult task to reconstruct its original distribution.

In most of the places above described *Juniperus* does not have much competition from other trees; but in Florida and some parts of the coastal plain of Georgia and Alabama it is usually found in dense calcareous hammocks, where it is pretty well shaded, even when full grown. It grows in shady places outside

* The interior hardwood region is not a sharply defined geographical unit, but it has certain distinctive characters besides the prevalence of hardwoods and the scarcity of pines. (On this latter point see Gattinger, Fl. Tenn. (ed. 2), 23–24. 1901.) Among them are: rock strata mostly Paleozoic and approximately horizontal, scarcity of sand and peat, wet winters and dry summers (in this connection see Gannett, U. S. Geol. Surv. Water Supply Paper no. 234, *pl. 2*, 1909), considerable seasonal fluctuation of streams, and frequency of polypetalous spring flowers, medicinal plants, and trees with durable dark-colored heart-wood.

There are in the United States about two dozen places named Lebanon, half a dozen New Lebanons, and a few others in which Lebanon forms a part of the name. Quite a number of these are in the interior hardwood region, and it is extremely probable that some of them (especially those in Kentucky, Tennessee and Alabama) were named from the abundance of cedar near by, in allusion to the classical "cedar of Lebanon." Although there is not much resemblance between our cedar and *Cedrus Libani*, the cedar of Lebanon, the people who named most of these places were probably not familiar with the Old World tree, which is not often cultivated in this country.

of the coastal plain, too, at least as far inland as Jefferson County, Alabama. There the characteristic spindle-shaped northern form abounds in old fields and rocky pastures between Birmingham and Bessemer, and the Florida form with loose drooping twigs is scattered through the flatwoods southwest of Bessemer, where it is well shaded by tall oaks and hickories.

In the numerous descriptions of the habitat of the cedar in the northern United States little or nothing is said about its having any particular fondness for lime. But in Alabama and adjoining states, where it is most abundant on limestone rocks, it is generally regarded as a lime-loving tree.* If it is, though, it differs strikingly from all other lime-loving trees of Eastern North America in having scale-like evergreen leaves, which is supposed to be a xerophytic adaptation. An explanation of its apparent fondness for lime will be suggested presently.

Notwithstanding the great adaptability of the cedar to diverse conditions of soil and climate, there are in eastern North America four rather widespread classes of natural habitats where it is conspicuous by its absence: (1) the great northern coniferous forests, extending from New Brunswick westward; (2) the common dry woods with oaks and hickories, which are represented in nearly all the eastern states; (3) the prairies, extending from Indiana westward; and (4) the pine-barrens, including the *Pinus rigida* barrens of Long Island and New Jersey, the *P. palustris* barrens from North Carolina to Texas, and the *P. Caribaea* barrens of South Florida.

Now if the various habitats of our tree can be found to have any one character or combination of characters in common, not shared by the other habitats just named, we will have the key to the situation.

One such character stands out prominently. The coniferous forests, dry woods, prairies and pine-barrens are burned over at intervals of a few to several years (the fires being set oftener now by man than they were by lightning and other natural causes in prehistoric times), while *the habitats affected by the cedar are rarely or never visited by fire.*

* See bibliography at end of this paper.

The sensitiveness of *Juniperus virginiana* to fire, a natural consequence of its thin bark,* has been commented on in some of the general works cited below, if not elsewhere; but the geographical significance of this fact seems never to have been pointed out before.

The various habitats of the cedar are protected from fire in different ways. Marshes and estuarine swamps are usually too wet for fire to travel through, and on dunes and rocks (the latter including the cedar-glades) the herbaceous vegetation is too sparse to feed flames. The exemption of pastures and fence-rows from fire is too obvious to require any further comment. In the Florida hammocks, as in other climax forests, the humus does not burn readily, partly because it is usually too damp, and partly because most of the carbon in it is already oxidized.†

The abundance of cedar on limestone rocks may now be partly explained by the fact that such rocks are most extensively exposed in the interior hardwood region and in other regions which were characterized originally by vast climax forests and now by cultivated fields, where forest fires from natural causes are and always have been very infrequent, apparently. It is possible, however, that a little lime in the soil may be advantageous to our tree, for it seems to be entirely absent from the fall-line sand-hills and stream sand-hills of the coastal plain, which are almost exempt from fire but decidedly non-calcareous; while the dunes on the coast must contain appreciable quantities of calcium carbonate in the form of comminuted sea-shells. Furthermore, outside of the glaciated region *Juniperus Virginiana* seems rarely or never to associate with any of the Ericaceae, a family of plants noted for their preference for acid soils.‡ Never-

* Its usually shallow root-system has been suggested as another factor which makes the cedar an easy prey to fire; but it would be hard to find a tree with shallower roots than *Pinus Caribaea* where it grows on limestone rocks southwest of Cocoanut Grove, Florida, and that species is almost immune to fire. The cedar usually branches near the ground, and that is probably another reason why it is more liable to injury by fire than some other trees.

† In this connection see Bull. Torrey Club 38: 524. 1911.

‡ In this connection see Hilgard, Soils 522. 1906; Coville, U. S. Bureau of Plant Industry Bull. 193: 19, 30. 1910; Harper, Ann. Rep. Fla. Geol. Surv. 3: 361. 1911.

theless, the evidence here presented seems to show that the cedar dreads fire more than it likes lime.

Notwithstanding its tolerance of shade and sensitiveness to fire, in which it differs from many other conifers and most pioneer trees, the cedar has other pioneer characters besides its "xerophytic" leaves. It thrives in very thin and poor soils, and is rarely found native in deep rich soils, especially those of alluvial bottoms, where fire-protection is almost at its maximum. In the blue-grass region of Kentucky, which is characterized by rich calcareous soils, it seems to be chiefly confined to dry rocky places, such as the cliffs of the Kentucky River. The Florida hammocks in which our tree abounded before it became the prey of the pencil-makers are very near sea-level (and usually rocky as well), and the marshes and estuarine swamps are of course still lower; so that in all such places the ground-water level is at all times so near the surface that there is only a shallow zone in which aeration can take place and the common soil-forming agencies can work. Perhaps the cedar has little use for earthworms and other nitrogen-producing organisms; its relations to these things deserve investigation.

The following list contains references to about 400 places, mostly in easily accessible publications, where the habitats of *Juniperus virginiana* (as that species is defined at the beginning of this paper) in various parts of Eastern North America are mentioned. No attempt has been made to refer to places where it is merely listed as growing in a certain region, without any indication of habitat, except in a very few cases of special interest. The references for each state are arranged chronologically as far as possible, and the states alphabetically. It may seem tiresome to cite so many pages of the same book in some cases, but the reader who is not sufficiently interested to go into the matter deeply can at least get from this a crude idea of the relative abundance of cedar in each state, and one who may be making a special study of the vegetation of any one state will probably find a multiplicity of references useful.*

* I have found nearly all these references in the libraries of either the Geological Survey of Alabama or the New York Botanical Garden. Most of those relating to Iowa were first brought to my attention by Prof. L. H. Pammel.

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Harshberger, Forest Leaves **9**: 44. 1903. (Edge of gorge at Natural Bridge.)

Wisconsin

Pammel, Garden and Forest **4**: 532. 1891. (Sandy bottoms, limestone rocks, etc.)

KEY TO THE WILD AND CULTIVATED TREES IN AUTUMN*

BY CHESTER ARTHUR DARLING

1 *a*. Leaves about 1/8 in. or less broad, often evergreen....................2.
b. Leaves more than 1/4 in. broad....................................34.
2 *a*. Leaves scale-like, more or less appressed to the stem, the tips sometimes spreading..3.
b. Leaves awl-shaped, linear, or needle-like, not appressed to the stem.....6.
3 *a*. Branchlets appear more or less 4-sided, not flattened laterally; all leaves more or less keeled..............**Red Cedar.** (*Juniperus virginiana.*)
b. Branchlets appear much flattened laterally, two rows of leaves flat and two rows keeled or ridged..4.
4 *a*. Branchlets about 1/16 in. broad, the flat leaves with a discoid marking on the back...........**Southern White Cedar.** (*Chamaecyparis thyoides.*)
b. Branchlets about 1/6 in. broad.......................................5.
5 *a*. Branchlets lighter colored beneath....**Arbor Vitae.** (*Thuja occidentalis.*)
b. Branchlets alike on both sides. **Oriental Arbor Vitae.** (*Thuja orientalis.*)
6 *a*. Leaves in clusters on the stem......................................7.
b. Leaves attached singly to the stem..................................20.
7 *a*. Leaves 2–5 in a cluster...8.
b. Leaves 10 or more in a cluster......................................17.
8 *a*. Leaves in clusters of 5, or some in 4's.............................9.
b. Leaves in clusters of 2 or 3..11.
9 *a*. Leaves 5-8 in. long, drooping, the young branches whitish; cultivated tree. **Bhotan Pine.** (*Pinus excelsa.*)
b. Leaves 2–5 in. long, not drooping, young branches not whitish..........10.
10 *a*. Young branches covered with brownish hairs; mature cones 2–4 in. long; cultivated tree..................**Swiss Stone Pine.** (*Pinus cembra.*)
b. Young branches not covered with brownish hairs; mature cones 3-6 in. long; native tree, often planted............**White Pine.** (*Pinus Strobus.*)
11 *a*. Leaves in clusters of 3..12.
b. Leaves in clusters of 2, or some in 3's.............................13.
12 *a*. Cultivated tree; mature cones 4–6 in. long. **Western Yellow Pine.** (*Pinus ponderosa.*)
b. Native tree; mature cones 2–3 in. long...**Pitch Pine.** (*Pinus rigida.*)
13 *a*. Average leaf less than 4 in long...................................14.
b. Average leaf 4 in. or more long.....................................15.

* This key is designed to be used in the field to determine the trees to be found growing in the eastern United States. In using the key begin with No. 1, read both *a* and *b* and choose the one which fits the specimen; follow the key as indicated by the number to which you are referred each time, reading both *a* and *b* until the name of the specimen is obtained. Accuracy in observation and in following the key are of first importance, choosing an average specimen is likewise important. Additional copies of this key may be had for 10 cents by addressing the author at Columbia University, New York City.

14 *a*. Leaves 1–3 in. long, dark green; native tree.
Jersey Pine. (*Pinus virginiana.*)
b. Leaves about 3 in. long, twisted, rather light green; cultivated tree.
Scotch Pine. (*Pinus sylvestris.*)
15 *a*. Cultivated tree; leaves much clustered at the ends of the branches; mature cones 2–3 in. long................**Austrian Pine.** (*Pinus austriaca.*)
b. Native tree; leaves not noticeably clustered at the ends of the branches; mature cones 1–2 in. long....................................16.
16 *a*. Some leaves on the branch in clusters of 3, others in 2's.
Yellow Pine. (*Pinus echinata.*)
b. All leaves in clusters of 2.................**Red Pine.** (*Pinus resinosa.*)
17 *a*. Leaves deciduous, borne on short bud-like branches..................18.
b. Leaves evergreen, not borne on short bud-like branches..............19.
18 *a*. Leaves about 3/4 in. long; mature cones about 1/2 in. long; native tree.
Tamarack. (*Larix laricina.*)
b. Leaves about 1 in. long; mature cones about 1 in. long; cultivated tree.
European Larch. (*Larix decidua.*)
19 *a*. Leaves 1/2–3/4 in. long; mature cones 2–3 in. long.
African Cedar. (*Cedrus Atlantica.*)
b. Leaves 1–3 in. long; mature cones 3–5 in. long.
Cedar-of-Lebanon. (*Cedrus Libani.*)
20 *a*. Leaves 3–6 in. long, in whorls at the ends of the branches; small cultivated tree.......................**Umbrella Pine.** (*Sciadopitys verticillata.*)
b. Leaves 2 in. or less long...21.
21 *a*. Each leaf extends down the stem, not jointed to it; leaves awl-shaped, rigid; small cultivated tree........**Japanese Cedar.** (*Cryptomeria japonica.*)
b. Trees not completely as in *a*....................................22.
22 *a*. Leaves thick, somewhat 4-sided; branches very rough when leaves are removed..23.
b. Trees not completely as in *a*....................................26.
23 *a*. Leaves 1/4–1/2 in. long, crowded, appressed to the branches.
Oriental Spruce. (*Picea orientale.*)
b. Leaves 1/2–1 in. long, not appressed to the branches...............24.
24 *a*. Leaves bluish or whitish, strongly incurved on the upper branches.
Blue Spruce. (*Picea pungens.*)
b. Leaves not completely as in *a*...................................25.
25 *a*. Leaves usually 3/4–1 in. long; mature cones 4–6 in. long; cultivated tree.
Norway Spruce. (*Picea Abies.*)
b. Leaves usually 1/2 in. long; mature cones 1–2 in. long; native tree.
Black Spruce. (*Picea Mariana.*)
26 *a*. Leaves rigid, tapering to the apex; some leaves usually scale-like.
Red Cedar. (*Juniperus virginiana.*)
b. Leaves not completely as in *a*...................................27.
27 *a*. Leaves deciduous, appearing only on the present year's branches; the young branches often deciduous...........**Cypress.** (*Taxodium distichum.*)
b. Leaves evergreen, appearing on 2-year old branches ....28.
28 *a*. Branches covered with small projections to which the leaves are attached..29.
b. Branches without projections, rather smooth when leaves are removed.30.

29 *a.* Leaves blunt at apex, about 1/2 in. long, with two white lines beneath when fresh .... **Hemlock.** (*Tsuga canadensis.*)

b. Leaves somewhat pointed at apex, 3/4–1 in. long.
European Yew. (*Taxus baccata.*)

30 *a.* Leaves pointed at the apex.. **Cephalonian Silver Fir.** (*Abies cephalonica.*)

b. Leaves blunt or notched at the apex .... 31.

31 *a.* Leaves blue-green, usually glaucous on the young shoots, often 4-sided.
Red Fir. (*Abies nobilis.*)

b. Leaves dark green and shining above, whitish beneath .... 32.

32 *a.* Native tree; leaves about 3/4 in. long; mature cones 2–4 in. long.
Balsam Fir. (*Abies balsamea.*)

b. Cultivated trees; average leaves usually more than 3/4 in. long; mature cones 4–6 in. long .... 33.

33 *a.* Leaves tapering to the base, somewhat curved.
Northern Silver Fir. (*Abies nordmanniana.*)

b. Leaves not completely as in *a* .... **Silver Fir.** (*Abies Picea.*)

34 *a.* Leaves or leaf scars opposite on the branch .... 35.

b. Leaves or leaf scars alternate on the branch .... 58.

35 *a.* Leaves simple .... 36.

b. Leaves compound .... 50.

36 *a.* Leaves with entire or wavy margin .... 37.

b. Leaves with toothed or lobed margins .... 40.

37 *a.* Leaves ovate, 2–5 in. long; small tree with bark peeling off in small rectangular patches .... **Flowering Dogwood.** (*Cornus florida.*)

b. Leaves broadly ovate; trees with rather smooth or flaky bark .... 38.

38 *a.* Leaves 2–3 in. long with wavy margins; cultivated tree.
Cercidiphyllum. (*Cercidiphyllum japonicum.*)

b. Leaves 6–12 in. long with entire margins .... 39.

39 *a.* Fruit of long pods 8–20 in. long .... **Catalpa.** (*Catalpa Catalpa.*)

b. Fruit of short capsules 1–2 in. long... **Empress Tree.** (*Paulownia tomentosa.*)

40 *a.* Leaves sharply toothed, not lobed, the teeth about 1/4 in. long; cultivated tree .... **Hornbeam Maple.** (*Acer carpinifolium.*)

b. Leaves more or less lobed .... 41.

41 *a.* Leaves very deeply 7–11-lobed, the lobes linear to lanceolate, narrow, sometimes relobed; cultivated tree..... **Japanese Maple.** (*Acer palmatum.*)

b. Leaves not completely as in *a* .... 42.

42 *a.* Leaves nearly circular in outline, 5–9-lobed, the lobes doubly toothed; cultivated tree .... **Round-leaved Maple.** (*Acer circinatum.*)

b. Leaves not completely as in *a* .... 43.

43 *a.* Leaves 3-lobed only toward the apex, the margins finely toothed all around; bark smooth, green, striped..... **Striped Maple.** (*Acer pennsylvanicum.*)

b. Leaves and bark not completely as in *a* .... 44.

44 *a.* Leaves with indentations extending more than half way to the petiole, whitish beneath; bark peeling off in thin flakes; branches often upturned at the ends .... **Silver Maple.** (*Acer saccharinum.*)

b. Trees not completely as in *a* .... 45.

45 *a.* Leaves 3–7-lobed, the lobes entire or the middle one sometimes slightly toothed; cultivated trees .... 46.

b. Leaves with lobes more or less toothed or relobed....................47.

46 *a*. Branches corky; leaves 3–5-lobed, the lobes blunt at apex.
English Maple. (*Acer campestre.*)

b. Branches not corky; leaves 5–7-lobed, the lobes pointed.
Colchicum-leaved Maple. (*Acer laetum.*)

47 *a*. Leaves usually 3-lobed, the lobes toothed; petiole and twigs usually red; bark usually smooth and light gray, usually rough only toward the base.
Red Maple. (*Acer rubrum.*)

b. Trees not completely as in *a*....................................48.

48 *a*. Lobes of leaves many-toothed, the teeth usually rounded, not with bristly tips......................**Sycamore Maple.** (*Acer pseudo-platanus.*)

b. Lobes of leaves with 2–4 coarse teeth, the teeth usually pointed or with bristly tips..49.

49 *a*. Cultivated tree; leaves 4–7 in. broad; bark smooth or short-furrowed.
Norway Maple. (*Acer platanoides.*)

b. Native tree; leaves 3–6 in. broad; bark peeling in elongated flakes.
Sugar Maple. (*Acer Saccharum.*)

50 *a*. Leaves palmately compound......................................51.

b. Leaves pinnately compound.......................................52.

51 *a*. Fruit prickly; tree rather commonly planted.
Horse-chestnut. (*Aesculus Hippocastanum.*)

b. Fruit not prickly; tree not very commonly planted.
Ohio Buckeye. (*Aesculus glabra.*)

52 *a*. Leaflets 3 or 5, coarsely toothed or lobed...**Box Elder.** (*Acer Negundo.*)

b. Leaflets 7 or more..53.

53 *a*. Fruit berry-like; bark corky.....**Cork Tree.** (*Phellodendron amurense.*)

b. Fruit winged; bark not corky......................................54.

54 *a*. Lateral leaflets stalked..55.

b. Lateral leaflets not stalked......................................56.

55 *a*. Fruit with wing nearly all terminal on the seed.
White Ash. (*Fraxinus americana.*)

b. Fruit with wing extending about half way down on the seed.
Red Ash. (*Fraxinus pennsylvanica.*)

56 *a*. Trees growing wild, in moist places.......**Black Ash.** (*Fraxinus nigra.*)

b. Cultivated trees...57.

57 *a*. Fruit 3/4–1 in. long; leaflets usually entire.
Flowering Ash. (*Fraxinus ornus.*)

b. Fruit 1–2 in. long; leaflets usually toothed.
English Ash. (*Fraxinus excelsior.*)

58 *a*. Leaves compound, composed of 3 or more leaflets....................59.

b. Leaves simple..75.

59 *a*. Leaflets usually 2 in. or less long, with entire margins; fruit a pod.....60.

b. Some or all of the leaflets more than 2 in. long, with entire or toothed margins..63.

60 *a*. Trees usually with thorns 1 in. or more long on the trunk; leaves usually doubly compound; pods 10 in. or more long, flat.
Thorny Locust. (*Gleditsia triacanthos.*)

b. Trees not completely as in *a*....................................61.

61 *a*. Leaves doubly compound; pods 6–10 in. long.
Coffee-tree. (*Gymnocladus dioica.*)
b. Leaves singly compound; pods 6 in. or less long....................62.
62 *a*. Usually short spines at the base of the petiole in place of stipules; branches zigzag; pods about 4 in. long; bark with long furrows.
Black Locust. (*Robinia pseudacacia*).
b. No spines at base of leaves as in *a*; cultivated tree.
Pagoda Tree. (*Sophora japonica.*)
63 *a*. Leaflets with entire margins; cultivated tree.
Yellow-wood. (*Cladrastis lutea.*)
b. Leaflets with margins more or less toothed or incised.................64.
64 *a*. Leaflets with only 2–8 teeth at the base; fruit winged.
Ailanthus. (*Ailanthus glandulosa.*)
b. Leaflets not completely as in *a*....................................65.
65 *a*. Leaflets irregularly toothed or incised; cultivated tree.
Varnish Tree. (*Koelreuteria paniculata.*)
b. Leaflets more or less regularly toothed.............................66.
66 *a*. Leaflets toothed towards the apex, usually less than 1 in. broad; fruit of red berries.........................**Mountain Ash.** (*Sorbus americana.*)
b. Leaflets usually toothed all around; fruit of nuts....................67.
67 *a*. Leaflets 13–25 to each leaf...68.
b. Leaflets 5–11...70.
68 *a*. Cultivated tree; nuts with wings about 3/4 in. broad.
Caucasian Walnut. (*Pterocarya fraxinifolia.*)
b. Native trees; nuts not winged...69.
69 *a*. Leaflets with sticky hairs; nut oblong.....**Butternut.** (*Juglans cinerea.*)
b. Leaflets not with sticky hairs; nut globose...**Black Walnut.** (*Juglans nigra.*)
70 *a*. Cultivated tree; shuck of nut not splitting.
English Walnut. (*Juglans regia.*)
b. Native trees; shuck splitting from the nut..........................71.
71 *a*. Bark of trunk shaggy in older trees; leaflets usually 5...............72.
b. Bark not shaggy; leaflets 5–11..73.
72 *a*. Nut about 3/4 in. or more broad; shuck comparatively thick; common tree.
Shagbark Hickory. (*Hicoria ovata.*)
b. Nut less than 3/4 in. broad; shuck comparatively thin; tree not common.
Small-fruited Hickory. (*Hicoria microcarpa.*)
73 *a*. Terminal bud yellowish, without thin scales; leaflets 7–11.
Bitternut Hickory. (*Hicoria minima.*)
b. Terminal bud not yellowish, with thin scales; leaflets 5–9...............74
74 *a*. Twigs covered with hairs just back of the terminal bud; leaflets usually 7; shuck of nut comparatively thick..........**Mockernut.** (*Hicoria alba.*)
b. Twigs not covered with hairs as in *a*; leaflets usually 5; shuck of nut thin.
Pignut. (*Hicoria glabra.*)
75 *a*. Trees with light colored patches on the upper trunk and branches where bark has peeled; fruit globose with stems 2 in. or more long...............76.
b. Tress not completely as in *a*..77.
76 *a*. Fruit in clusters of 2 or more...**Oriental Sycamore.** (*Platanus orientalis.*)
b. Fruit single, not in clusters...**American Sycamore.** (*Platanus occidentalis.*)

77 *a*. Leaves somewhat fan-shaped, the apex usually deeply incised; cultivated tree.............................**Maiden-hair Tree.** (*Ginkgo biloba.*)
b. Leaves not completely as in *a*..78.
78 *a*. Leaves broadly notched at apex, usually with 2 lateral and 2 basal lobes; fruit cylindrical...**White Wood. Tulip Poplar.** (*Liriodendron tulipifera.*)
b. Leaves not notched at apex, usually pointed..........................79.
79 *a*. Leaves somewhat star-shaped, 5-7-pointed, deep red in autumn; fruit globose, prickly; twigs often with wings of cork.
Sweet Gum. (*Liquidambar styraciflua.*)
b. Leaves not star-shaped..80.
80 *a*. Bark spicy; leaves with 1–3 lobes or some not lobed.
Sassafras. (*Sassafras Sassafras.*)
b. Trees not completely as in *a*..81.
81 *a*. Leaves with entire or smooth margins..........................82.
b. Leaves with toothed or lobed margins..........................89.
82 *a*. Small trees usually with thorns on the branches; fruit globose, 2 in. or more in diameter; a milky sap often exudes from cut or broken twigs.
Mock Orange. (*Toxylon pomiferum.*)
b. Trees not completely as in *a*..83.
83 *a*. Branches conspicuously massed toward the top of trees, horizontal, often drooping; bark often checkered; leaves usually red in autumn; fruit berry-like..................**Sour Gum. Tulepo.** (*Nyssa sylvatica.*)
b. Trees not completely as in *a*..84.
84 *a*. Leaves whitish beneath, rather thick.....**Magnolia.** (*Magnolia virginiana.*)
b. Leaves not whitish beaneath..85.
85 *a*. Leaves 10–24 in. long.........**Umbrella Tree.** (*Magnolia tripetala.*)
b. Leaves 5 in. or less long..86.
86 *a*. Fruit somewhat fluffy, in large panicles, very conspicuous on the small tree.
Smoke Tree. (*Cotinus cotinoides.*)
b. Trees not completely as in *a*..87.
87 *a*. Leaves somewhat rounded; fruit a pod..**Judas Tree.** (*Cercis canadensis.*)
b. Leaves oval to lanceolate..88.
88 *a*. Leaves oval; fruit fleshy; bark in patches.
Persimmon. (*Diospyros virginiana.*)
b. Leaves linear-lanceolate; fruit an acorn.
Willow Oak. (*Quercus Phellos.*)
89 *a*. Leaves with margins more or less lobed, with more than 3 lobes; fruit an acorn..90.
b. Leaves usually with toothed margins, sometimes with 2 or 3 lobes; or palmately veined; fruit not an acorn or wanting..................101.
90 *a*. Lobes of leaves more or less pointed or with bristly tips; cup of acorn with comparatively smooth scales on the outside.....................91.
b. Lobes of leaves more or less rounded, not with bristly tips; cup of acorn rough on the outside..95.
91 *a*. Average leaf 3–5 in. long; branches conspicuously horizontal or drooping, and low down on the trunk; acorn about 1/2 in. long.
Pin Oak. (*Quercus palustris.*)
b. Trees not completely as in *a*..92.

92 *a.* Leeaves conspicuously wedge-shaped with 3–5 rather short, rounded lobes with bristly tips............. **Black-jack Oak.** (*Quercus marylandica.*)

b. Lobes of leaves pointed.. 93.

93 *a.* Cup of acorn shallow, saucer-shaped, enclosing 1/8–1/4 of the mature acorn; lobes of leaves usually triangular.......... **Red Oak.** (*Quercus rubra.*)

b. Cup of acorn encloses about 1/2 of the mature acorn; lobes of leaves not usually triangular.. 94.

94 *a.* Inner bark yellow or orange and very bitter; scales of cup fringed or reflexed about the top of cup; lobes of leaf often at right angles to the midrib. **Black Oak.** (*Quercus velutina.*)

b. Inner bark not as in *a*; scales of cup usually compressed about the acorn; lobes of leaves often relobed toward outer ends. **Scarlet Oak.** (*Quercus coccinea.*)

95 *a.* Bark on trunk furrowed, dark gray................................ 96.

b. Bark on trunk flaky, usually light gray............................ 98.

96 *a.* Cup of acorn fringed; leaves usually regularly lobed; cultivated tree. **Turkey Oak.** (*Quercus cerris.*)

b. Cup of acorn not fringed.. 97.

97 *a.* Native tree; leaves regularly lobed; cup enclosed about 1/4 or less of the acorn; bark with very hard triangular ridges. **Rock Chestnut Oak.** (*Quercus prinus.*)

b. Cultivated tree; leaves variously lobed; cup encloses 1/3 or more of the acorn. **English Oak.** (*Quercus pedunculata.*)

98 *a.* Lobes of leaves short, the indentations about 1/4 the distance to the midrib; bark very loose on the smaller branches; cup with stalk 2–4 in. long. **Swamp White Oak.** (*Quercus platanoides.*)

b. Trees not completely as an *a*.................................... 99.

99 *a.* Lobes of leaves usually narrow toward the base, often relobed at the apex; leaves usually thick and with brownish hairs beneath. **Post Oak.** (*Quercus minor.*)

b. Leaves not completely as in *a*.................................. 100.

100 *a.* Cup conspicuously fringed at top, mossy; tree not common. **Bur Oak.** (*Quercus macrocarpa.*)

b. Cup not fringed at top; tree common... **White Oak.** (*Quercus alba.*)

101 *a.* Bark smooth, dark gray, the trunk ridged or sinew-like; fruit with leaf-like wings, in pairs.................. **Blue Beech.** (*Carpinus caroliniana.*)

b. Trees not completely as in *a*.................................. 102.

102 *a.* Bark smooth, light gray, without horizontal markings; terminal bud slender, tapering, 1/2–1 in. long.................................. 103.

b. Bark and terminal buds not completely as in *a*.................... 104.

103 *a.* Leaves hairy beneath, sometimes purplish; cultivated species. **European Beech.** (*Fagus sylvatica.*)

b. Leaves not hairy beneath; native species. **American Beech.** (*Fagus grandifolia.*)

104 *a.* Leaves with margin toothed only toward apex, entire toward the base; fruit berry-like, sweet; bark on trunk often corky at base. **Hackberry.** (*Celtis occidentalis.*)

b. Leaves toothed all around the margin.............................. 105.

105 *a*. Leaves 5 in. or more long, with very sharply toothed margins; fruit a prickly bur...106.
b. Leaves and fruit not completely as in *a*...........................107.
106 *a*. Native tree; leaves tapering to the apex.
American Chestnut. (*Castanea dentata.*)
b. Cultivated tree; leaves abruptly pointed at apex.
European Chestnut. (*Castanea sativa.*)
107 *a*. Leaves somewhat rounded, often unequal at the base; fruit leaf-like with small globose nutlets attached; buds often reddish and placed to one side of the leaf-scar..108.
b. Trees not completely as in *a*....................................110.
108 *a*. Leaves white-woolly beneath; cultivated tree.
Silver Linden. (*Tilia tomentosa.*)
b. Leaves not white-woolly beneath..................................109.
109 *a*. Cultivated tree; leaves with a tuft of wool in the axils of the veins beneath.
European Linden. (*Tilia vulgaris.*)
b. Native tree; leaves not usually as in *a*.....**Basswood.** (*Tilia americana.*)
110 *a*. Bark on trunk peels off in elongated, rather regular vertical strips; fruit hop-like.............................**Ironwood.** (*Ostrya virginiana.*)
b. Bark and fruit not completely as in *a*...........................111.
111 *a*. Leaves usually irregularly and deeply toothed or lobed; palmately veined; thorns usually present on the branches; fruit somewhat fleshy.....112.
b. Trees not completely as in *a*....................................119.
112 *a*. Thorns more or less curved; leaves broadly ovate, doubly toothed.....113.
b. Thorns straight; leaves obovate or ovate..........................115.
113 *a*. Lower surface of leaves densely hairy; fruit with hairy stalks.
Red-fruited Thorn. (*Crataegus mollis.*)
b. Lower surface of leaves not densely hairy..........................114.
114 *a*. Leaves rounded or heart-shaped at base.
Washington Thorn. (*Crataegus cordata.*)
b. Leaves usually tapering at the base.
Pruinose Thorn. (*Crataegus pruinosa.*)
115 *a*. Thorns 1/2 in. or less long; leaves ovate, 3–15-lobed or cleft; cultivated tree.
English Hawthorn. (*Crataegus oxyacantha.*)
b. Thorns 3/4 in. or more long..116.
116 *a*. Fruit solitary or 2–3 together, yellow when ripe; margin of leaves with broad teeth.........................**Dwarf Thorn.** (*Crataegus uniflora.*)
b. Fruit 3 or more together, usually red when ripe....................117.
117 *a*. Leaves usually shining above, not doubly toothed; stalks of fruit not hairy.
Cockspur Thorn. (*Crataegus crus-galli.*)
b. Leaves not shining above, usually doubly toothed; stalks of fruit hairy..118.
118 *a*. Fruit about 1/2 in. in diameter, reddish-brown when ripe; leaves lobed.
Red Haw. (*Crataegus coccinea.*)
b. Fruit 1/2–1 in. in diameter, yellow or red when ripe; leaves not usually lobed.
Large-fruited Thorn. (*Crataegus punctata.*)
119 *a*. Bark on trunk and on branches with horizontal markings usually 1/2 in. or more long, ususally 1/4 in. or less broad; bark not with regular longitudinal furrows...120.

b. Bark not completely as in *a*....................................127.
120 *a*. Leaves triangular in shape....................................121.
b. Leaves rather ovate to oblong in shape....................................122.
121 *a*. Bark close on trunk not in loose sheets; native tree.
Gray Birch. (*Betula populifolia.*)
b. Bark in rather loose sheets on the trunk; cultivated tree.
European White Birch. (*Betula alba.*)
122 *a*. Bark creamy white, in rather loose sheets on the trunk of older trees.
Paper Birch. (*Betula papyrifera.*)
b. Bark yellowish, gray, or brown, not whitish....................................123.
123 *a*. Bark yellowish, in rather thin loose sheets on the trunk.
Yellow Birch. (*Betula lutea.*)
b. Bark not yellowish....................................124.
124 *a*. Fruit usually present on the tree, consisting of hard or woody aments; short twigs present on the branches; bark of twigs not bitter; leaves rather ovate....................................125.
b. Fruit not present; bark of twigs bitter....................................126.
125 *a*. Bark greenish-brown to reddish, in thin loose layers; bark not usually sweet nor aromatic; trees usually growing in damp places.
Red Birch. (*Betula nigra.*)
b. Bark dark-brown or ashy-gray, close on the trunk or peeling in flakes or plates; bark sweet and aromatic; common tree in rather dry places.
Sweet Birch. (*Betula lenta.*)
126 *a*. Leaves mostly oblong, teeth on margin usually incurved; often brownish hairs along the midvein beneath...**Black Cherry.** (*Prunus serotina.*)
b. Leaves mostly obovate; teeth on margin somewhat spreading, usually pointed........................**Choke Cherry.** (*Prunus virginiana.*)
127 *a*. Leaves with all secondary veins parallel, prominent and oblique to the midrib. 128.
b. Leaves not with secondary veins parallel as in *a*....................................131.
128 *a*. Fruit cone-like; leaves with the blade equal at the base.
European Alder. (*Alnus glutinosa.*)
b. Fruit always wanting; leaves with blade usually unequal at the base; outer bark often somewhat corky....................................129.
129 *a*. Leaves not noticeably rough above; buds not hairy.
American Elm. (*Ulmus americana.*)
b. Leaves rough on upper surface; buds hairy....................................130.
130 *a*. Native tree; upper branches drooping and slender; tree usually growing in moist places........................**Slippery Elm.** (*Ulmus fulva.*)
b. Cultivated tree; upper branches ascending or horizontal, rather coarse.
English Elm. (*Ulmus campestris.*)
131 *a*. Leaves usually not more than twice as long as broad; lateral buds with numerous scales....................................132.
b. Leaves usually more than twice as long as broad; lateral buds with a single scale....................................141.
132 *a*. Petioles of leaves flattened laterally....................................133.
b. Petioles of leaves not flattened laterally....................................136.
133 *a*. Leaves white-woolly beneath and lobed...**White Poplar.** (*Populus alba.*)
b. Leaves not completely as in *a*....................................134.

134 *a.* Leaves more or less triangular in shape............................135.
b. Leaves not triangular..136.

135 *a.* Leaves 2–3 in. broad, branches erect or ascending.
Lombardy Poplar. (*Populus italica.*)
b. Leaves 3–7 in. broad; branches more or less spreading.
Cottonwood. (*Populus deltoides.*)

136 *a.* Terminal bud about 1/2 in. or more long, usually pointed...........137.
b. Terminal bud 1/4 in. or less long, usually rounded...................138.

137 *a.* Leaves ovate, the margins usually with large irregular teeth 1/8 in. or more long..................**Large-toothed Aspen.** (*Populus grandidentata.*)
b. Leaves round-heart-shaped, 1–3 in. broad, the margin with rather small regular teeth usually less than 1/8 in. long.
American Aspen. (*Populus tremuloides.*)

138 *a.* Leaves fragrant when crushed, not densely hairy when young, the apex usually tapering...............**Balm-of-Gilead.** (*Populus candicans.*)
b. Leaves not fragrant when crushed, densely hairy when young, the apex blunt, the basal lobes often overlapping.
Downy Poplar. (*Populus heterophylla.*)

139 *a.* Branches densely hairy; bark on trunk usually spotted.
Paper Mulberry. (*Broussonetia papyrifera.*)
b. Branches not hairy; bark not spotted..........................140.

140 *a.* Mature leaves dull green on upper surface, often rough.
Red Mulberry. (*Morus rubra.*)
b. Mature leaves usually shining and smooth on upper surface.
White Mulberry. (*Morus alba.*)

141 *a.* Mature leaves shining on both sides, not hairy, ovate to lanceolate; twigs shining............................**Shining Willow.** (*Salix lucida.*)
b. Mature leaves not shining on both sides..........................142.

142 *a.* Leaves green on both sides, not conspicuously lighter colored beneath; branchlets pale yellow; leaves 1/4–3/4 in. broad, narrowly lanceolate.
Black Willow. (*Salix nigra.*)
b. Leaves conspicuously lighter colored beneath.....................143.

143 *a.* Leaves 1/4–1/2 in. broad, 3–7 in. long, very pale beneath; twigs slender and drooping......................**Weeping Willow.** (*Salix babylonica.*)
b. Trees not completely as in *a*....................................144.

144 *a.* Mature leaves 3/4–2 in. broad, very pale beneath.
Pussy Willow. (*Salix discolor.*)
b. Mature leaves 1/2–3/4 in. broad...................................145.

145 *a.* Large trees with twigs usually shining yellow...**White Yellow.** (*Salix alba.*)
b. Slender trees with twigs reddish-green, very brittle at the base.
Crack Willow. (*Salix fragalis.*)

COLUMBIA UNIVERSITY

THE FLORA OF NORTHAMPTON COUNTY, PENNSYLVANIA

By Wilbur L. King

(Continued from June Torreya)

CERATOPHYLLACEAE

Ceratophyllum demersum L. In ponds and slow streams. (Porter.)

MAGNOLIACEAE

Liriodendron Tulipifera L. Along Lehigh river; on Calypso Island, Bethlehem.

RANUNCULACEAE

Caltha palustris L. In meadows along Saucon creek near Hellertown.

Trollius laxus Salisb. In swamps. (Porter.)

Coptis trifolia (L.) Salisb. In damp, mossy woods and bogs. (Porter.)

Cimicifuga racemosa (L.) Nutt. In rich woods on Lehigh Mt. near Lehigh University; also along Saucon creek. July 1, 1899.

Aquilegia canadensis L. In shady places on limestone rocks along Monocacy creek several miles north of Bethlehem and in similar situations along the Lehigh river 1 mile east of Bethlehem. May 9, 1896.

Delphinium Ajacis L. In waste places. (Porter.)

Delphinium Consolida L. In waste places, Bethlehem.

Anemone virginiana L. In thickets along Lehigh canal between Bethlehem and Freemansburg. July, 1897.

Anemone canadensis L. Found for a single season (in 1868) on Calypso Island and since extinct. (Reported in Bethlehem Times July 22, 1878.)

Anemone riparia Fernald. On river banks. (Porter.)

Anemone quinquefolia L. In moist woods along Monocacy creek 1½ miles north of Bethlehem. May 1, 1897.

Hepatica Hepatica (L.) Karst. In rich woods, Lehigh Mt.; also 2 miles north of Bethlehem along Monocacy creek. Apr. 24, 1897.

Syndesmon thalictroides (L.) Hoffmg. In woods, Lehigh Mt. April 28, 1896.

Clematis virginiana L. Climbing over bushes in dry soil at Glendon. Aug. 20, 1899.

Atragene americana Sims. A trailing vine. (Porter.)

Ranunculus reptans L. On shores. (Porter.)

Ranunculus abortivus L. In woods and shady places, Bethlehem. April 28, 1897.

Ranunculus recurvatus Poir. In woods on Lehigh Mt. May 22 ,1898.

Ranunculus acris L. In meadows along Monocacy and Saucon creeks; in moist soil along Lehigh canal, Bethlehem. June 5, 1900.

Ranunculus bulbosus L. In fields near Bethlehem. Common. Aug. 18, 1896.

Ranunculus pennsylvanicus L. f. In wet open places. (Porter.)

Ranunculus repens L. In fields and roadsides. (Porter.)

Ranunculus septentrionalis Poir. In swamps along Monocacy creek. May 17, 1897.

Ranunculus hispidus Michx. In copses on Lehigh Mt. at altitude of about 900 feet. May 30, 1898.

Thalictrum dioicum L. In woods on Lehigh Mt.; also along Monocacy creek. April 30, 1896.

Thalictrum purpurascens L. In woodlands. (Porter.)

Thalictrum polygamum Muhl. In moist soil along bank of Lehigh river near South Bethlehem. July 15, 1899.

BERBERIDACEAE

Berberis vulgaris L. In thickets. (Porter.)
Caulophyllum thalictroides (L.) Michx. In woods. (Porter.)
Podophyllum peltatum L. In moist shady soil along Lehigh river 1 mile east of Bethlehem; along Saucon creek.

MENISPERMACEAE

Menispermum canadense L. In thickets, Bethlehem. June 5, 1902.

LAURACEAE

Sassafras Sassafras (L.) Karst. In dry woods, Lehigh Mt. May 6, 1900.
Benzoin Benzoin (L.) Coult. In moist woods, Lehigh Mt. and along Lehigh river east of Bethlehem and along Monocacy creek north of Bethlehem. April 22, 1897.

PAPAVERACEAE

Papaver somniferum L. In waste grounds. (Porter.)
Papaver Rhoeas L. In waste ground along Monocacy creek. Occasionally. June 20, 1901.
Papaver dubium L. In waste and cultivated grounds. (Porter.)
Argemone mexicana L. In waste places. (Porter.)
Sanguinaria canadensis L. In rich woods, Lehigh Mt. near South Bethlehem; along Monocacy creek 2 miles north of Bethlehem. April 28, 1896.
Chelidonium majus L. Along roadsides and waste places about Bethlehem. Common. May 9, 1898.
Glaucium corniculatum Curtis. On African iron ore in grounds of the Bethlehem Steel Co. (E. A. Rau in Bull. Torr. Club 8: 114. 1881.)
Bicuculla Cucullaria (L.) Millsp. In rich soil in thickets along Lehigh river one mile east of Bethlehem. Local and rare. April 21, 1896.
Fumaria officinalis (L.) In waste places and on ballast. (Porter.)

CRUCIFERAE

Lepidium campestre (L.) R. Br. In waste places, Bethlehem. July 25, 1899.
Lepidium ruderale L. In waste places and along roadsides. (Porter.)
Lepidium virginicum L. Common along roadsides and waste places, Bethlehem.
Sisymbrium officinale (L.) Scop. Common in waste places, Bethlehem. May 23, 1899.
Sisymbrium altissimum L. In waste places, Bethlehem. Rare. July 1, 1899.
Sinapis alba L. In waste places, Bethlehem. July 30, 1904.
Brassica nigra (L.) Koch. In fields and waste places. (Porter.)
Brassica juncea (L.) Cosson. In waste places. (Porter.)
Brassica arvensis (L.) B. S. P. In waste places, Bethlehem.
Brassica campestris L. In cultivated grounds and occasionally in waste places.
Brassica oleracea L. Has been found as an escape. (Porter.)
Raphanus Raphanistrum L. In fields and waste places, Bethlehem.
Raphanus sativus L. Cultivated and occasionally spontaneous in waste places.
Rapistrum rugosum (L.) All. On old road on College Hill, Easton. (Porter.)
Barbarea Barbarea (L.) MacM. In fields and waste places; also in moist ground along Monocacy and Saucon Creeks. May 20, 1897.
Barbarea stricta Andrz. In fields and waste places. (Porter.)
Barbarea praecox (J. E. Smith) R. Br. In waste places. (Porter.)
Roripa sylvestris (L.) Bess. In low grounds and waste places. (Porter.)

RORIPA PALUSTRIS (L.) Bess. In wet soil along bank of Lehigh river, Bethlehem. In fruit July 10, 1899.
RORIPA HISPIDA (Desv.) Britton. In wet places. (Porter.)
RORIPA NASTURTIUM (L.) Rusby. In springs along Saucon creek; in Monocacy creek 2 miles north of Bethlehem. In fruit and flower July 23, 1900.
RORIPA ARMORACIA (L.) A. S. Hitchcock. In moist ground, Bethlehem.
CARDAMINE PENNSYLVANICA Muhl. Along mountain stream near Lehigh University. In fruit and flower May 30, 1900. Altitude 850 feet.
CARDAMINE PARVIFLORA L. On dry rocks. (Porter.)
CARDAMINE FLEXUOSA With. In wet woods, streams, and mountain swamps. (Porter.)
CARDAMINE BULBOSA (Schreb.) B. S. P. In wet meadows along Monocacy creek 1 mile north of Bethlehem. May 13, 1897.
DENTARIA LACINIATA Muhl. In moist or rich woods. (Porter.)
BURSA BURSA-PASTORIS (L.) Britton. Common in fields, roadsides and waste grounds. Bethlehem. May 23, 1899.
CAMELINA MICROCARPA Andrz. In vacant lots and roadsides, Bethlehem. June 1, 1902.
DRABA VERNA L. In fields at Seidersville. April 28. (G. W. Caffrey.)
SOPHIA SOPHIA (L.) Britton. At Bethlehem. June and July. (G. W. Caffrey.)
STENOPHRAGMA THALIANA (L.) Celak. In fields, Bethlehem. April 17, 1898.
ARABIS LYRATA L. In rocky soil one mile east of Bethlehem; also in Allen township. May 9, 1896.
ARABIS HIRSUTA (L.) Scop. In rocky places. (Porter.)
ARABIS LAEVIGATA (Muhl.) Poir. In rocky woods. (Porter.)
ARABIS CANADENSIS L. In woodland along Monocacy creek near Bethlehem.
ARABIS GLABRA (L.) Bernh. In field and rocky places along Delaware river above Easton. (Porter.)
ERYSIMUM REPANDUM L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Torrey Bulletin, Jan., 1892.
ALYSSUM ALYSSOIDES (L.) Gouan. In fields. (Porter.)
KONIGA MARITIMA (L.) R. Br. In waste places, escaped. (Porter.)
HESPERIS MATRONALIS L. In fields and along roadsides. (Porter.)
CONRINGIA ORIENTALIS (L.) Dumort. In waste places, Bethlehem.

RESEDACEAE

RESEDA LUTEA L. On pile of African iron ore on grounds of Bethlehem Steel Co. (E. A. Rau in Bull. Torr. Club **8**: 114. 1881.)

DROSERACEAE

DROSERA ROTUNDIFOLIA L. In bogs and wet sand. (Porter.)

PODOSTEMACEAE

PODOSTEMON CERATOPHYLLUM Michx. In shallow streams. (Porter.)

CRASSULACEAE

SEDUM THELEPHIUM L. In fields and along roadsides. (Porter.)
SEDUM TELEPHIOIDES Michx. In dry soil near Bethlehem.
SEDUM ACRE L. On rocks and along roadsides. (Porter.)
SEDUM TERNATUM Michx. Spreading freely in the Old Moravian cemetery, Bethlehem. May 20, 1899.
PENTHORUM SEDOIDES L. In wet soil along bank of Lehigh river. Bethlehem. July 15, 1899.

SAXIFRAGACEAE

SAXIFRAGA PENNSYLVANICA L. In swamps and on wet banks. (Porter.)
SAXIFRAGA MICRANTHIDIFOLIA (Haw.) B. S. P. In cold brooks, Bethlehem. (Britton & Brown Illus. Flora, Vol. 2, page 174.)

SAXIFRAGA VIRGINIENSIS Michx. In dry soil along Lehigh river between Bethlehem and Freemansburg. Common. April 30, 1896.
HEUCHERA AMERICANA L. In rocky woods near South Bethlehem. June 20, 1901.
MITELLA DIPHYLLA L. In rocky woods, Lehigh Mt. April 30, 1896.
CHRYSOSPLENIUM AMERICANUM Schwein. In wet shady places along mountain streams near Lehigh University. Aug. 18, 1900. Altitude 850 feet.
PARNASSIA CAROLINIANA Michx. In swamps and low meadows. (Porter.)
HYDRANGEA ARBORESCENS L. In rocky woodland near South Bethlehem.
PHILADELPHUS INODORUS L. Escaped from cultivation, Easton. (Porter.)

GROSSULARIACEAE

RIBES OXYACANTHOIDES L. In wet woods and low grounds. (Porter.)
RIBES UVA-CRISPA L. In dry soil along towpath of Lehigh canal near Bethlehem. May 12, 1902.
RIBES FLORIDUM L'Her. In dry soil along towpath near Bethlehem. May 1.
RIBES RUBRUM L. In cold woods, freely escaping. (Porter.)

HAMAMELIDACEAE

HAMAMELIS VIRGINIANA L. Along Lehigh river near Bethlehem. Oct. 1, 1896.

PLATANACEAE

PLATANUS OCCIDENTALIS L. Along banks Lehigh river, Bethlehem to Easton. May 12, 1901.

ROSACEAE

OPULASTER OPULIFOLIUS (L.) Kuntze. Along Lehigh river east of Bethlehem. June 1, 1897.
SPIRAEA SALICIFOLIA L. In woods between Bethlehem and Easton.
SPIRAEA TOMENTOSA L. In swamps and low grounds. (Porter.)
PORTERANTHUS TRIFOLIATUS (L.) Britton. In woods near Wind Gap. June 3, 1890.
RUBUS ODORATUS L. In woods near South Bethlehem. July 15, 1899.
RUBUS STRIGOSUS Michx. In dry or rocky situations. (Porter.)
RUBUS OCCIDENTALIS L. In thickets along towpath between Bethlehem and Freemansburg. May 20, 1900.
RUBUS VILLOSUS Ait. In thickest and in dry soil along canal; also at Nazareth. May 27, 1900.
RUBUS RANDII (Bailey) Rydb. In dry soil. (Porter.)
RUBUS HISPIDUS L. In swamps or low grounds. (Porter.)
RUBUS BAILEYANUS Britton. In dry woods and thickets. (Porter.)
RUBUS CANADENSIS L. In fields and in dry soil in Lower Saucon and near Bethlehem. May 30, 1899.
FRAGARIA VIRGINIANA Duchesne. In dry soil near Bethlehem. May 8, 1897.
FRAGARIA VESCA L. In fields and roadsides, Bethlehem.
DUCHESNEA INDICA (Andr.) Focke. On roadsides, Bethlehem. In fruit and flower Sept. 20, 1902.
POTENTILLA ARGUTA Pursh. On dry or rocky hillsides along Delaware river at Easton. (Porter.)
POTENTILLA ARGENTEA L. In dry soil along the Delaware river, Easton. (Porter.)
POTENTILLA MONSPELIENSIS L. In fields and waste places, Bethlehem.
POTENTILLA CANADENSIS L. In dry soil, Bethlehem. May 13, 1897.
POTENTILLA PUMILA Poir. In poor soil. (Porter.)
WALDSTEINIA FRAGARIOIDES (Michx.) Tratt. Wooded and shaded hillsides. (Porter.)
GEUM CANADENSE Jacq. In thickets and shaded places, Bethlehem. July 10, 1899.
GEUM VIRGINIANUM L. In low grounds. (Porter.)

GEUM FLAVUM (Porter) Bicknell. In woods. (Porter.)
GEUM STRICTUM Ait. In swamps or low grounds. (Porter.)
AGRIMONIA HIRSUTA (Muhl.) Bicknell. In woods near South Bethlehem.
AGRIMONIA MOLLIS (T. & G.) Britton. Dry woods and thickets. (Porter.)
AGRIMONIA BRITTONIANA Bicknell. Along thickets and roadsides. (Porter.)
AGRIMONIA PARVIFLORA Soland. In wet soil along Lehigh river at Island Park. Aug. 25, 1902.
SANGUISORBA CANADENSIS L. In swamps and low meadows. (Porter.)
ROSA CAROLINA L. In low grounds and swamps. (Porter.)
ROSA HUMILIS Nash. In dry or rocky soil. (Porter.)
ROSA LUCIDA Ehrh. On shores or in dry or sandy soil. (Porter.)
ROSA CANINA L. In waste places and along roadsides. (Porter.)
ROSA RUBIGINOSA L. In waste places. (Porter.)

POMACEAE

MALUS CORONARIA (L.) Mill. Along Saucon creek. (J. A. Ruth.)
MALUS MALUS (L.) Britton. Occasionally in woods and thickets.
ARONIA ARBUTIFOLIA (L.) Ell. In swamps and wet woods. (Porter.)
ARONIA NIGRA (Willd.) Britton. In swamps and low woods and sometimes in drier soil. (Porter.)
AMELANCHIER CANADENSIS (L.) Medic. In woods, Lehigh Mt., April 24, 1897.
AMELANCHIER BOTRYAPIUM (L. f.) DC. In swamps and moist soil. (Porter.)
AMELANCHIER SPICATA (Lam.) Dec. In dry rocky places. (Porter.)
CRATAEGUS PUNCTATA Jacq. In thickets. (Porter.)
CRATAEGUS PUNCTATA CANESCENS Britton. Near Easton. (Porter.)
CRATAEGUS OXYACANTHA L. Along roadsides and in thickets, sparingly escaped from cultivation, Bethlehem.
CRATAEGUS COCCINEA L. In woods along Lehigh river near Bethlehem. May 17, 1897.
CRATAEGUS ROTUNDIFOLIA (Ehrh.) Borck. In open woods. (Porter.)
CRATAEGUS MACRACANTHA Lodd. In rocky soil and thickets, Bethlehem. May 27, 1897.
CRATAEGUS TOMENTOSA L. In thickets. (Porter.)
CRATAEGUS UNIFLORA Muench. In sandy soil. (Porter.)

DRUPACEAE

PRUNUS AMERICANA Marsh. In woods and thickets. (Porter.)
PRUNUS PUMILA L. On sand or gravel shores. (Porter.)
PRUNUS CUNEATA Raf. In wet soil or among rocks. (Porter.)
PRUNUS CERASUS L. In thickets along Lehigh river between Bethlehem and Freemansburg.
PRUNUS AVIUM L. In thickets and woodlands. (Porter.)
PRUNUS PENNSYLVANICA L. f. In rocky woods and clearings. (Porter.)
PRUNUS MAHALEB L. Thickets and waste places. (Porter.)
PRUNUS VIRGINIANA L. Along bank of Lehigh river and in rocky situations.
PRUNUS SEROTINA Ehrh. In fields about Bethlehem. May 23, 1899.
AMYGDALUS PERSICA L. Escaped from cultivation in waste places, Bethlehem.

CAESALPINACEAE

CASSIA NICTITANS L. In dry soil ½ mile east of Bethlehem.
CASSIA MARYLANDICA L. In moist sandy soil along Lehigh river near Bethlehem. Aug. 5, 1899.
GLEDITSIA TRIACANTHOS L. In dry soil, Bethlehem.

PAPILIONACEAE

BAPTISIA TINCTORIA (L.) R. Br. In woods on Lehigh Mt. July 22, 1899. Altitude 900 feet.
CROTALARIA SAGITTALIS L. In dry open places. (Porter.)

CYTISUS SCOPARIUS (L.) Link. Grown on banks along P. & R. Ry. between Bethlehem and Hellertown as an experiment to prevent rain washing the soil on the tracks in the cuts. May 20, 1896.
MEDICAGO SATIVA L. In fields and waste places. (Porter.)
MEDICAGO LUPULINA L. In waste places, Bethlehem.
MEDICAGO DENTICULATA Willd. On ore dumps in Bethlehem Steel Co.'s yard. Reported in Bull. Torrey Club **19**: 9. 1892.
MELILOTUS ALBA Desv. In waste places along Lehigh canal ½ mile east of Bethlehem. July 13, 1898.
MELILOTUS OFFICINALIS (L.) Lam. In waste places, Bethlehem.
MELILOTUS INDICA (L.) All. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 9. 1892.
TRIFOLIUM AGRARIUM L. In fields and waste places, Bethlehem.
TRIFOLIUM PROCUMBENS L. In fields, Bethlehem. Frequent.
TRIFOLIUM INCARNATUM L. In fields, waste places and ballast. (Porter.)
TRIFOLIUM ARVENSE L. In fields near Bethlehem.
TRIFOLIUM PRATENSE L. In fields and roadsides.
TRIFOLIUM MARITIMUM Huds. Found at Bethlehem. (Porter.)
TRIFOLIUM HYBRIDUM L. In fields and waste places. (Porter.)
TRIFOLIUM REPENS L. In fields and waste places, Bethlehem. July 22, 1899.
CRACCA VIRGINIANA L. In thickets between Bethlehem and Nazareth; also at Wind Gap July 2. Altitude about 978 feet. (G. W. Caffrey.)
ROBINIA PSEUDACACIA L. In woods, Bethlehem. May 18, 1899.
STYLOSANTHES BIFLORA (L.) B. S. P. In dry soil. (Porter.)
MEIBOMIA NUDIFLORA (L.) Kuntze. In woods, Bethlehem. Aug. 25, 1900.
MEIBOMIA GRANDIFLORA (Walt.) Kuntze. In woods on Lehigh Mt. July 22, 1899.
MEIBOMIA MICHAUXII Vail. In dry woodland along Monocacy creek ½ mile north of Bethlehem. Sept. 7, 1899.
MEIBOMIA OCHROLEUCA (M. A. Curtis) Kuntze. In woodlands. (Porter.)
MEIBOMIA BRACTEOSA (Michx.) Kuntze. In thickets. (Porter.)
MEIBOMIA PANICULATA (L.) Kuntze. In meadows along Monocacy creek 1 mile north of Bethlehem. Aug. 12, 1899.
MEIBOMIA LAEVIGATA (Nutt.) Kuntze. In dry woods. (Porter.)
MEIBOMIA VIRIDIFLORA (L.) Kuntze. In dry woods. (Porter.)
MEIBOMIA DILLENII (Darl.) Kuntze. In meadows near Bethlehem. Aug. 12, 1899.
MEIBOMIA CANADENSIS (L.) Kuntze. In sandy soil along Lehigh river near Bethlehem. Aug. 5, 1899.
MEIBOMIA RIGIDA (Ell.) Kuntze. In dry soil, Easton. Aug. 24, 1889.
MEIBOMIA MARYLANDICA (L.) Kuntze. In dry soil and in copses. (Porter.)
MEIBOMIA OBTUSA (Muhl.) Vail. In dry soil. (Porter.)
LESPEDEZA REPENS (L.) Bart. In dry or sandy soil. (Porter.)
LESPEDEZA PROCUMBENS Michx. In dry soil. (Porter.)
LESPEDEZA NUTTALLII Darl. In dry soil. (Porter.)
LESPEDEZA VIOLACEA (L.) Pers. In dry rocky soil in Monocacy valley 2½ miles north of Bethlehem. Sept. 3, 1899.
LESPEDEZA VIRGINICA (L.) Britton. In dry soil. (Porter.)
LESPEDEZA HIRTA (L.) Ell. In dry soil. (Porter.)
VICIA CRACCA L. In dry soil. (Porter.)
VICIA AMERICANA Muhl. In ballast along railroad 1½ miles north of Bethlehem. June 20, 1901.
VICIA CAROLINIANA Walt. On river banks and cliffs. (Porter.)
VICIA HIRSUTA (L.) Koch. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 9. 1892.
VICIA SATIVA L. In field at Bethlehem. Fruit mature in July.
LATHYRUS VENOSUS Muhl. At Bethlehem. (Porter.) On rocky hillsides in Allen township. June 3, 1901.
LATHYRUS MYRTIFOLIUS Muhl. In ballast along C. R. R. of N. J. tracks east of Bethlehem. (G. W. Caffrey.)
FALCATA COMOSA (L.) Kuntze. In thickets at Island Park. Aug. 25, 1902.

Apios Apios (L.) MacM. In moist soil. (Porter.)
Phaseolus polystachyus (L.) B. S. P. (Porter.) In dry soil along canal near Bethlehem; along Delaware river, Easton. Aug., 1896.
Strophostyles helvola (L.) Britton. In sandy soil, Bethlehem. (Porter.)

GERANIACEAE

Geranium maculatum L. In moist woods in Saucon valley, Monocacy valley and on Lehigh Mt. Ascends about 900 feet. May 13, 1897.
Geranium carolinianum L. In dry soil along Saucon creek, 1 mile from its mouth.
Geranium pusillum L. In waste places. (Porter.)

OXALIDACEAE

Oxalis violacea L. In woods, Bethlehem. May 30, 1899.
Oxalis stricta L. In woods, fields and roadsides, Bethlehem. Common. Aug. 12, 1899.
Oxalis cymosa Small. In woods and fields. (Porter.)

LINACEAE

Linum usitatissimum L. In ballast along Lehigh Valley R. R. near Bethlehem. July 10, 1900.
Linum virginianum L. In woodland between Bethlehem and Easton. July 22, 1911.
Linum striatum Walt. In bogs and swamps. (Porter.)

ZYGOPHYLLACEAE

Tribulus terrestris L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Torrey Bulletin, Jan., 1892.

RUTACEAE

Xanthoxylum americanum Mill. In woods and thickets. (Porter.)
Ptelea trifoliata L. In woods. (Porter.)

SIMARUBACEAE

Ailanthus glandulosa Desf. Escaped along roadsides. (Porter.) Several large trees growing in cultivation in Bethlehem.

POLYGALACEAE

Polygala verticillata L. In moist soil near South Bethlehem. (J. A. Ruth.)
Polygala viridescens L. In meadows at Wind Gap.
Polygala Senega L. In woods on Lehigh Mt. Ascends to 900 feet. May 30, 1898.
Polygala paucifolia Willd. In moist rich woods. (Porter.)

EUPHORBIACEAE

Acalypha virginica L. In waste places and thickets, Bethlehem. Aug. 5, 1899.
Euphorbia maculata L. (Porter.)
Euphorbia hirsuta (Torr.) Wiegand. In sandy or gravelly soil. (Porter.)
Euphorbia nutans Lag. In fields and waste places, Bethlehem.
Euphorbia corollata L. In dry and rocky soil 1 mile east of Bethlehem. Aug. 30, 1898.
Euphorbia marginata Pursh. In waste places, Bethlehem. Occasionally.
Euphorbia Lathyris L. In waste places. (Porter.)
Euphorbia Peplus L. On ore dumps in Bethlehem Steel Co.'s yard. Reported in Bull. Torrey Club **19**: 10. 1892.

Euphorbia Terracina L. On ore dumps in Bethlehem Steel Co.'s yard. Reported in Bull. Torrey Club **19**: 10. 1892.
Euphorbia Cyparissias L. In waste places, Bethlehem. May 1898.

CALLITRICHACEAE

Callitriche palustris L. Mostly in cold and running water. (Porter.)
Callitriche heterophylla Pursh. In ponds and slow streams. (Porter.)

LIMNANTHACEAE

Floerkea proserpinacoides Willd. In marshes and along rivers. (Porter.)

ANACARDIACEAE

Rhus copallina L. In dry soil along Lehigh river. July 22, 1899.
Rhus hirta (L.) Sudw. In dry soil along Lehigh river. July 22, 1899.
Rhus glabra L. In dry soil near Bethlehem. July 10, 1899.
Rhus Vernix L. In swamps. (Porter.)
Rhus radicans L. In thickets along streams and is only too common along the Lehigh canal; also in Monocacy valley.
Cotinus cotinoides (Nutt.) Britton. Escaped from cultivation, Easton. (Porter.)

ILICACEAE

Ilex verticillata (L.) A. Gray. In swamps. (Porter.)
Ilicioides mucronata (L.) Britton. In swamps. (Porter.)

CELASTRACEAE

Euonymus atropurpureus Jacq. In moist soil along Saucon creek 1 mile from its mouth.
Euonymus europaeus L. Escaped from cultivation. (Porter.)
Celastrus scandens L. In dry soil along Lehigh river between Bethlehem and Freemansburg, May 30, 1900; along Monocacy valley near Bethlehem. In fruit Nov. 1.

STAPHYLEACEAE

Staphylea trifolia L. In thickets along Lehigh canal between Bethlehem and Freemansburg. May 12, 1902.

ACERACEAE

Acer saccharinum L. Along streams. (Porter.) Extensively used as shade trees in Bethlehem.
Acer rubrum L. On banks of Lehigh river near South Bethlehem.
Acer Saccharum Marsh. In rich woods. (Porter.)
Acer nigrum Michx. (Porter.)
Acer spicatum Lam. In damp, rocky woods. (Porter.)
Acer Negundo L. Along streams. (Porter.)

HIPPOCASTANACEAE

Æsculus Hippocastanum L. Escaped from cultivation, Easton. (Porter.)

BALSAMINACEAE

Impatiens biflora Walt. In wet grounds along Monocacy and Saucon creeks. Aug. 12, 1899.
Impatiens aurea Muhl. In moist soil along Lehigh river and Monocacy creek. July 22, 1899.

RHAMNACEAE

RHAMNUS CATHARTICA L. In dry soil, Easton. (Porter.)
RHAMNUS LANCEOLATA Pursh. In woodland near Wind Gap.
CEANOTHUS AMERICANUS L. In woods between Easton and Bethlehem; also on Lehigh Mt. near Lehigh University. July 1, 1900.

VITACEAE

VITIS AESTIVALIS Michx. In dry soil along Lehigh river.
VITIS BICOLOR Le Conte. In woods. (Porter.)
VITIS VULPINA L. Along Lehigh river in dry soil. June 3, 1899.
VITIS CORDIFOLIA Michx. In moist thickets and along streams. (Porter.)
PARTHENOCISSUS QUINQUEFOLIA (L.) Planch. In dry soil and in thickets near Bethlehem.

TILIACEAE

TILIA AMERICANA L. Along bank of Lehigh River near Bethlehem.

MALVACEAE

ALTHAEA ROSEA Cav. Has escaped from gardens. (Porter.)
MALVA SYLVESTRIS L. In waste places and along roadsides. (Porter.)
MALVA ROTUNDIFOLIA L. In waste places and about dwellings, Bethlehem.
MALVA MOSCHATA L. In waste places. (Porter.)
MALVA ALCEA L. A few specimens found in a meadow along Saucon creek about 2 miles from its mouth. Sept. 4, 1900.
ABUTILON ABUTILON (L.) Rusby. In waste places, Bethlehem.
HIBISCUS TRIONUM L. In waste places. (Porter.)
HIBISCUS SYRIACUS L. Escaped from cultivation, Bethlehem.

HYPERICACEAE

HYPERICUM ASCYRON L. Along bank of Lehigh river, Bethlehem. July 15, 1899.
HYPERICUM ELLIPTICUM Hook. In sandy soil on Calypso Island. Aug., 1899.
HYPERICUM PERFORATUM L. In fields, Bethlehem.
HYPERICUM MACULATUM Walt. In woods near South Bethlehem. (J. A. Ruth.)
HYPERICUM MUTILUM L. In moist grounds along mountain stream, Lehigh Mt.
HYPERICUM CANADENSE L. In wet, sandy soil. (Porter.)
SAROTHRA GENTIANOIDES L. In sandy soil. (Porter.)
TRIADENUM VIRGINICUM (L.) Raf. In swamps. (Porter.)

CISTACEAE

HELIANTHEMUM CANADENSE (L.) Michx. In dry soil on Lehigh Mt. (J. A. Ruth.)
LECHEA RACEMULOSA Michx. In dry sandy or rocky soil. (Porter.)
LECHEA VILLOSA Ell. In dry soil. (Porter.)
LECHEA INTERMEDIA Leggett. In dry open places. (Porter.)

(*To be continued*)

NEWS ITEMS

The statement on page 120 of May TORREYA that the Flora Brasiliensis was to be found in America only at the University of Illinois, Harvard, Columbia, and the Missouri Botanical Garden was incomplete. Copies of this work have turned up at

Detroit, in the library of Parke, Davis and Company, at the Academy of Natural Sciences at Philadelphia, and at the Ohio State University.

Dr. Edgar W. Olive, professor of botany in the State College of South Dakota and state botanist, has been appointed curator at the Brooklyn Botanic Garden, to have charge of the department of public instruction and also of the work in plant pathology. The appointment takes effect on September 1, next.

Dr. C. J. Chamberlin of the University of Chicago has just returned from Australia and South Africa where he has been making a field study of the oriental cycads, and collecting material for a detailed morphological investigation.

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A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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THE TORREY BOTANICAL CLUB

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TORREYA

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ROADSIDE PLANTS OF A HIGH MOUNTAIN PARK IN COLORADO

By Mary Esther Elder

The following is a report on a collection of roadside plants made by Professor Francis Ramaley in the summer of 1911 at the University of Colorado Mountain Laboratory at Tolland, Colorado. The laboratory is situated in Boulder Park, Gilpin Co., about forty-seven miles from Denver and eighteen miles from Boulder. The altitude of Tolland is 8,889 feet. The list is of interest as showing the roadside weeds of a rather high mountain station.*

Boulder Park is on the old Rollins Pass Road which goes from the plains across the range into Middle Park. This road has been used for the last forty or fifty years, by cattlemen, to drive cattle over into Middle Park for pasturing. Nederland and Central City, both old mining camps, eight and twelve miles away, respectively, may be reached by road from Boulder Park. Rollinsville, formerly a placer mining camp is five miles distant on the direct wagon road from the plains region, through Boulder Park, to the Continental Divide. The Moffat Railroad was built through the Park about eight years ago, thus making another means for the introduction of new plants. The soil along the roadsides is, for the most part, very dry and either sandy or rocky. Nearly all of the species here recorded occur in this dry soil. The following, however, are found in moister

[No. 7, Vol. 12, of Torreya, comprising pp. 145–174, was issued 11 July 1912.]

* There are only two articles which the writer has found giving information regarding the subject of roadside weeds in Colorado: European Plants Growing without Cultivation in Colorado, by Francis Ramaley, printed in Annales du Jardin Botanique de Buitenzorg, 1909, and Remarks on the Distribution of Plants in Colorado East of the Divide, by Francis Ramaley, reprinted from Postelsia, 1901.

places: *Juncus balticus montanus, Rumex acetosella, Rumex occidentalis, Rumex crispus, Rumex salicifolius, Anchusa officinalis, Prunella vulgaris, Iva xanthifolia* and *Festuca rubra.*

The altitudinal limits of the plants listed are given by Rydberg* as 4,000 to 13,000 feet. Some plants are found above their hitherto reported range as: *Festuca rubra, Bromus tectorum, Elymus canadensis, Rumex crispus, Chenopodium oblongifolium, Melilotus officinalis, Iva xanthifolia,* these all being reported by Rydberg as reaching altitudes of 7,000 feet or less.

Sixty-four plants are listed below; of these sixteen belong to Poaceae, six to Polygonaceae and thirteen to Compositae. Forty-two plants of the list are native to North America. Some, however, have been introduced into Boulder Park from lower altitudes and probably do not produce seeds there. Twenty-one are introduced from Europe, Asia or Tropical America. *Plantago major* (common plantain) is cosmopolitan but, of course, introduced at this altitude from lower stations.

POACEAE

Phleum pratense L. Common Timothy.
Europe.

Trisetum majus (Vasey) Rydb. Larger False Oats.
Native.

Koeleria cristata (L.) Pers. Prairie-grass.
Native.

Dactylis glomerata L. Common Orchard Grass.
Europe.

Poa pratensis L. Kentucky Blue-grass.
Europe; Asia; North America.

Poa compressa L. English Blue-grass.
Europe and Asia. Introduced to North America.

Poa serotina Ehr.
Native.

Festuca rubra L. Red Fescue.
Europe, Asia.

Bromus pumpellianus Scribn. Pumpelly's Brome.
Native.

* Rydberg, Flora of Colorado, 1906.

Bromus tectorum L. Thatch Cheat.
Europe.

Agropyron violaceum (Hornem.) Vasey. Violet Wheat Grass.
Native.

Agropyron tenerum Vasey. Slender Wheat Grass.
Native.

Agropyron occidentale Scribn. Western Wheat Grass.
Native. (Introduced from lower altitudes.)

Hordeum jubatum L. Squirrel-tail Grass.
Native. (Introduced from lower altitudes.)

Hordeum sativum hexastichon (L.) Hack. Six-rowed Barley.
Old World, thence to the New.

Elymus canadensis Linn. Canadian Wild Rye.
Native. (Introduced from lower altitudes.)

JUNCACEAE

Juncus balticus montanus Engelm. Mountain Baltic Rush.
Native.

POLYGONACEAE

Rumex acetosella L. Sheep Sorrel.
Europe: Asia, thence to North America.

Rumex occidentalis Wats. Dense-flowered Dock.
Native.

Rumex crispus L. Curly Dock.
Europe and Asia, thence to North America.

Rumex salicifolius Weinm. Willow-leaved Dock.
Native.

Polygonum aviculare L. Doorweed.
Asia: Europe: North America.

Tiniaria convolvulus (L.) Webb. & Moq. False Buckwheat.
Europe, Asia, thence to North America.

CHENOPODIACEAE

Chenopodium oblongifolium (S. Wats.) Rydb. Oblong Leaved Goosefoot.
Native.

Chenopodium album L. Common Pigweed.
Europe, Asia.

Monolepis nuttalliana (R. & S.) Engelm. Nuttall's Monolepis.
Native.

PAPAVERACEAE

Capnoides aureum (Willd.) Kuntze. Golden Corydalis.
Native.

BRASSIACEAE

Lepidium ramosissimum A. Nels. Pepper Grass.
Native.

Lepidium densiflorum Schrad. Apetalous Pepper Grass.
Europe.

Bursa Bursa-pastoris (L.) Britton. Common Shepherd's Purse.
Europe, thence now cosmopolitan.

Roripa sinuata (Nutt.) A. S. Hitch. Spreading Yellow Cress.
Native. (Probably introduced from lower altitudes.)

Brassica arvensis (L.) B.S.P. Wild Mustard.
Europe.

CAPPARIDACEAE

Peritoma serrulatum (Pursh) DC. Rocky Mountain Bee Plant.
Native. (Introduced from lower altitudes. Probably does not mature seeds.)

ROSACEAE

Rubus strigosus Michx. Raspberry.
Native.

Potentilla monspeliensis L. Rough Cinquefoil.
Native.

Potentilla pennsylvanica strigosa Pursh. Villous Pennsylvania Cinquefoil. Native.

Fragaria glauca (S. Wats.) Rydb. Glaucous Strawberry.
Native.

FABACEAE

Trifolium pratense L. Red Clover.
Europe and Asia, thence cultivated and naturalized in all temperate lands.

Trifolium repens L. White Clover.
Europe.

Melilotus officinalis (L.) Lam. Yellow Melilot.
Europe and Asia, thence to North America. (Probably does not mature seeds at this altitude.)

Aragallus deflexus (Pall.) Heller. Deflexed Loco-weed.
Native.

EPILOBIACEAE

Chamaenerion angustifolium (L.) Scop. Narrow-leaved Fireweed.
Native.

Gayophytum ramossisimum T. & G. Gayophyte.
Native.

POLEMONIACEAE

Collomia linearis Nutt. Narrow-leaved Collomia.
Native.

HYDROPHYLLACEAE

Phacelia leucophylla Torr. White-leaved Phacelia.
Native.

Phacelia sericea Hook. Hairy Phacelia.
Native.

BORAGINACEAE

Lappula occidentalis (S. Wats.) Greene. Western Stickweed.
Native.

Anchusa officinalis L.
Europe.

LAMIACEAE

Dracocephalum parviflorum Nutt. Small-flowered Dragon's Head.
Native.

Prunella vulgaris L. Common Self-heal.
Europe and Asia, thence to North America, where northward it is possibly native.

PLANTAGINACEAE

Plantago major L. Common Plantain.
Cosmopolitan. (Introduced at this altitude from lower stations.)

AMBROSIACEAE

Iva xanthifolia Nutt. Burweed Marsh-elder.
Native. (Probably does not produce seeds at this altitude.)

COMPOSITAE

Grindelia erecta A. Nels. Erect Gum Plant.
Native.

Chrysopsis villosa (Pursh) Nutt. Villous Golden Aster.
Native.

Solidago concinna Nels. Golden Rod.
Native.

Aster adscendens Lindl. Ascending Aster.
Native.

Machaeranthera viscosa (Nutt.) Greene. Sticky Aster.
Native.

Achillea lanulosa Nutt. Woolly Yarrow.
Native.

Artemisia Forwoodii S. Wats. Forwood's Sage. (Segregate of *Artemisia canadensis*.)
Native.

Artemisia frigida Willd. Barrens Sage.
Native.

Artemisia rhizomata A. Nels. Cudweed Sage.
Native.

Artemisia gnaphalioides Nutt. Cudweed Sage.
Native.

Senecio rosulatus Rydb. Tufted Groundsel.
Native.

Senecio ambrosioides Rydb. Ragweedlike Groundsel.
Native.

Taraxacum Taraxacum (L.) Karst. Common Dandelion.
Europe, thence to North America.

CHLORANTHY AND VIVIPARY IN THE STAMINATE INFLORESCENCE OF EUCHLAENA MEXICANA

By J. Arthur Harris

In certain grasses, the constituent members of the spikelet are sometimes found more or less completely foliaceous,* the ovary

Fig. 1. Excessive glume development of *Euchlaena mexicana.*

and stamens sterile or abortive. Becoming detached, these sterile spikelets may serve for vegetative propagation. Indeed,

* See, for instance, Masters, Vegetable Teratology, pp. 168–170. The Graminaceae in Penzig's Pflanzen Teratologie may be gone through for references to the literature of individual species.

in certain species this method of reproduction is practically the normal one.* Such forms have sometimes been designated as viviparous, and the term is extended beyond the cases in which there is an actual vegetative reproduction, to those in which there is merely a teratological foliation of the spikelet.

Chloranthy is a term applied to the transformation of the parts of the flower into foliar organs, and this term might perhaps more properly be applied to many cases which have been described as vivipary, not only in grasses but among other monocotyledons.

The purpose of this note is, however, not to discuss the literature of this phenomenon, but merely to call attention to a rather remarkable case in *Euchlaena mexicana*, supposedly the ancestor of Indian corn.

One of the terminal staminate inflorescences of a small plot of plants grown in the Missouri Botanical Garden† in the summer of 1903 was noticed by my friend Dr. G. G. Hedgecock to be highly abnormal and he kindly placed the accompanying photograph in my hands. It shows a condition of excessive development of the glumes.

To determine whether these teratological spikelets were capable of continued development, a number of them were potted up in

* See Goebel, Organographie der Pflanzen, pp. 153, 159.

† The seeds were received as "Mais de Coyote" from a gentleman in San Luis Potosi, who stated that it is generally thought that under cultivation the form would change into ordinary maize. As examined the tenth of September most of the stalks were in a vigorous green condition, the pistillate inflorescences not yet mature. All who have grown the form (Watson, Baily, Harshberger) have noted the lateness of maturing. The largest of the culms attained a height of ten to thirteen feet. The suckering was not as conspicuous as described by Watson, while the habit of producing elongated axillary branches was retained, but owing to the immature condition of the plants much cannot be stated concerning the behavior of the axillary (pistillate) inflorescences. Watson does not mention the adventitious roots, but Harshberger notes the production of strong aerial roots at nearly all nodes below the ears. The same is true in my material, as many as the lower thirteen nodes being well supplied with these organs.

Whatever their ancestry—whether pure *E. mexicana* or with some admixture of *Zea Mays*—the Missouri Botanical Garden plants were very close to the typical *E. mexicana*.

The immaturity of the pistillate inflorescence at frost precludes the settling of some of the minor details.

sand, and later transferred to soil. Good roots were secured, and a considerable expansion of the leaves and elongation of the internodes, but I am inclined to doubt whether any new leaves were laid down. One of these rooted spikelets produced three stigmas, "silks," an additional abnormality in the staminate inflorescence.

Such chloranthy or vivipary has sometimes been observed in *Zea Mays*. Perhaps some one finding it again may be so fortunate as to get good vegetative propagations. Possibly the technique adopted in my attempts was not adequate, but a wide series of experiments could not be made.

THE FLORA OF NORTHAMPTON COUNTY, PENNSYLVANIA

By Wilbur L. King

(*Continued from July* Torreya)

VIOLACEAE

Viola palmata L. In thickets in Monocacy valley 1 mile north of Bethlehem, Apr. 22, 1897.; on dry hillsides of Lehigh Mt. near South Bethlehem, May 30. Altitude 850 feet.

Viola papilionacea Pursh. In woodlands. (Porter.)

Viola obliqua Hill. In woodland along Monocacy Creek 1 mile north of Bethlehem. April 22, 1897.

Viola domestica Bickn. In cultivated soil and about dwellings. Bethlehem.

Viola cucullata Ait. In bogs and meadows. (Porter.)

Viola villosa Walt. In woods near South Bethlehem. May 30.

Viola sororia Willd. In woodland along Monocacy valley near Bethlehem.

Viola sagittata Ait. In wet meadows and marshes. (Porter.)

Viola fimbriatula J. E. Smith. On hillsides of Lehigh Mt. near Lehigh University. Altitude 850 feet.

Viola pedata L. At Bougher Hill, Williams township (J. A. Ruth). In copse on Lehigh Mt. May 9, 1896. Altitude 900 feet.

Viola odorata L. In thickets along Monocacy creek 1 mile north of Bethlehem.

Viola blanda Willd. In damp woods on Lehigh Mt. May 13, 1899.

Viola lanceolata L. In wet meadows along streams. (Porter.)

Viola pubescens Ait. In woods on Lehigh Mt. April 27, 1896.

Viola scabriuscula (T. & G.) Schwein. In moist woods along Monocacy creek 1½ miles north of Bethlehem.

Viola striata Ait. In moist thickets along Lehigh canal 1 mile east of Bethlehem. May 9, 1896.

Viola rostrata Pursh. In rocky woods. (Porter.)

Viola tricolor L. In waste places, sparingly escaped. (Porter.)

Viola Rafinesquii Greene. On hillsides. (Porter.)

Cubelium concolor (Forst.) Raf. In moist woods. (Porter.)

THYMELEACEAE

DIRCA PALUSTRIS L. In woods and thickets. (Porter.)

LYTHRACEAE

DECODON VERTICILLATUS (L.) Ell. In swamps. (Porter.)
LYTHRUM SALICARIA L. In moist places along the Delaware River at Portland, July 4, 1912.
PARSONSIA PETIOLATA (L.) Rusby. In sandy soil, and in fields 1 mile east of Bethlehem and in meadow 1 mile north of Bethlehem.

ONAGRACEAE

ISNARDIA PALUSTRIS L. In muddy ditches and swamps. (Porter.)
LUDWIGIA ALTERNIFOLIA L. In moist sandy soil along Lehigh river near Bethlehem. Aug. 5, 1899.
CHAMAENERION ANGUSTIFOLIUM (L.) Scop. In dry soil. (Porter.)
EPILOBIUM COLORATUM Muhl. In meadow land, Bethlehem. Aug. 12, 1899.
ONAGRA BIENNIS (L.) Scop. In dry soil 1 mile east of Bethlehem. July 10, 1899.
KNEIFFIA PUMILA (L.) Spach. In clearing on Lehigh Mt. Altitude 900 feet.
KNEIFFIA FRUTICOSA (L.) Raimann. In dry soil. (Porter.)
KNEIFFIA FRUTICOSA PILOSELLA (Raf.) Britton. On banks. (Porter.)
GAURA BIENNIS L. In dry soil at Island Park. Aug. 25, 1902.
CIRCAEA LUTETIANA L. In moist woods on Lehigh Mt. near Lehigh University. Altitude 850 feet. July 1, 1899.
CIRCAEA ALPINA L. Associated with the preceding species. June 1, 1899.

HALORAGIDACEAE

PROSERPINACA PALUSTRIS L. In swamps. (Porter.)

ARALIACEAE

ARALIA RACEMOSA L. In rich woods. (Porter.)
ARALIA NUDICAULIS L. In woods on Lehigh Mt. May 22, 1898.
PANAX QUINQUEFOLIUM L. In rich woods. (Porter.)
PANAX TRIFOLIUM L. In damp woodland at Nazareth. July 7, 1901.

UMBELLIFERAE

DAUCUS CAROTA L. In fields and waste places; entirely too frequent.
ANGELICA ATROPURPUREA L. In swamps and moist grounds. (Porter.)
ANGELICA VILLOSA (Walt.) B. S. P. In dry soil. (Porter.)
OXYPOLIS RIGIDUS (L.) Britton. In swamps. (Porter.)
HERACLEUM LANATUM Michx. In moist grounds. (Porter.)
PASTINACA SATIVA L. In waste places and along roadsides, Bethlehem, Easton and Portland. Common.
THASPIUM TRIFOLIATUM (L.) Britton. In woods. (Porter.)
THASPIUM TRIFOLIATUM AUREUM (Nutt.) Britton. In woods and shaded situations east of Bethlehem.
THASPIUM BARBINODE (Michx.) Nutt. Along streams. (Porter.)
SANICULA MARYLANDICA L. In woods near South Bethlehem.
SANICULA GREGARIA Bicknell. In woods and thickets. (Porter.)
SANICULA CANADENSIS L. In woodland. (Porter.)
FOENICULUM FOENICULUM (L.) Karst. In waste places. (Porter.)
TAENIDA INTEGERRIMA (L.) Drude. In rocky or sandy soil. (Porter.)
PIMPINELLA SAXIFRAGA L. In waste places, Easton. (Porter.)
ANTHRISCUS CEREFOLIUM (L.) Hoffm. Naturalized from Europe. (Porter.)
CHAEROPHYLLUM PROCUMBENS (L.) Crantz. In moist shady soil along Lehigh canal 1 mile east of Bethlehem. May 12, 1900.
WASHINGTONIA CLAYTONI (Michx.) Britton. In woods and clearings. (Porter.)

Washingtonia longistylis (Torr.) Britton. In shaded, sandy soil, Calypso Island, Bethlehem.
Conium maculatum L. In waste places. (Porter.)
Sium circutaefolium Gmel. In swamps. (Porter.)
Zizia aurea (L.) Koch. In moist soil along towpath between Bethlehem and Freemansburg. June 3, 1899.
Cicuta maculata L. Along bank of Lehigh river, Bethlehem; also along the Delaware River, Portland.
Cicuta bulbifera L. In wet soil along Lehigh canal near Bethlehem. Sept. 16, 1899.
Deringa canadensis (L.) Kuntze. In shaded sandy soil on Calypso Island. Aug. 7, 1899; along Delaware River, Portland.
Aegopodium Podagraria L. In waste places, Bethlehem. (Porter.)
Hydrocotyle americana L. In wet places. (Porter.)
Coriandrum sativum L. Adventive. (Porter.)

CORNACEAE

Cornus florida L. In rocky woods along Monocacy valley 1 mile north of Bethlehem. May 17, 1897.
Cornus Amonum Mill. In wet soil. (Porter.)
Cornus stolonifera Michx. In moist soil near Island Park. Aug. 25, 1901.
Cornus candidissima Marsh. In rich soil along Monocacy creek. June 20, 1901.
Cornus alternifolia L. f. In woods near Bethlehem.
Nyssa sylvatica Marsh. In rich soil, Bethlehem.

CLETHRACEAE

Clethra alnifolia L. In wet soil. (Porter.)

PYROLACEAE

Pyrola rotundifolia L. In dry woods. (Porter.)
Pyrola elliptica Nutt. In woods on Lehigh Mt. Ascends 850 feet. July 1, 1899.
Chimaphila maculata (L.) Pursh. In woods on Lehigh Mt.
Chimaphila umbellata (L.) Nutt. In rocky woodland on Lehigh Mt. near South Bethlehem. Ascends to 850 feet; also at Nazareth.

MONOTROPACEAE

Monotropa uniflora L. In woods on Lehigh Mt. July, 1896.
Hypopitys Hypopitys (L.) Small. In dry woods. (Porter.)

ERICACEAE

Azalea nudiflora L. In copses on Lehigh Mt. May 22, 1898.
Azalea nudiflora glandifera Porter. (Porter.)
Azalea viscosa L. In swamps. (Porter.)
Rhododendron maximum L. In woods on Lehigh Mt.
Kalmia angustifolia L. In moist soil. (Porter.)
Kalmia latifolia L. On rocky hillsides, Lehigh Mt. near Lehigh University. Ascends 800 feet. May 30, 1900.
Xolisma ligustrina (L.) Britton. In swamps and wet soil. (Porter.)
Epigaea repens L. In woods between Bethlehem and Nazareth. April 25, 1896.
Gaultheria procumbens L. In woodland near Wind Gap. July 4, 1901.

VACCINIACEAE

Gaylussacia frondosa (L.) T. & G. In moist woods. (Porter.)
Gaylussacia resinosa (Ait.) T. & G. In woods near South Bethlehem. (J. A. Ruth.)

VACCINIUM CORYMBOSUM L. In swamps, thickets and low woods. (Porter.) In woods near South Bethlehem. (J. A. Ruth.)
VACCINIUM CANADENSE Richards. In moist places. (Porter.)
VACCINIUM PENNSYLVANICUM Lam. In dry, rocky or sandy soil. (Porter.)
VACCINIUM VACILLANS Kalm. In dry soil. (Porter.)
VACCINIUM STAMINEUM L. In dry woods and thickets. (Porter.)
OXYCOCCUS MACROCARPUS (Ait.) Pers. In bogs. (Porter.)

PRIMULACEAE

LYSIMACHIA PUNCTATA L. In waste places. (Porter.)
LYSIMACHIA QUADRIFOLIA L. In thickets on Lehigh Mt. Altitude 900 feet. June 12, 1896.
LYSIMACHIA TERRESTRIS (L.) B. S. P. In wet grounds along canal, Bethlehem. July 20, 1899.
LYSIMACHIA NUMMULARIA L. In damp or grassy situations, Bethlehem.
STEIRONEMA CILIATUM (L.) Raf. In moist sandy soil along Lehigh river east of Bethlehem. July 15, 1899, also at Portland.
TRIENTALIS AMERICANA Pursh. In damp woods and thickets. (Porter.)
ANAGALLIS ARVENSIS L. In meadows along Monocacy creek 1 mile north of Bethlehem. July, 1896.

EBENACEAE

DIOSPYROS VIRGINIANA L. In fields and woods. (Porter.)

OLEACEAE

SYRINGA VULGARIS L. Escaped from cultivation. (Porter.)
FRAXINUS AMERICANA L. In moist soil along Monocacy creek near Bethlehem. Sept. 3, 1899, in fruit.
FRAXINUS PENNSYLVANICA Marsh. In moist soil. (Porter.)
FRAXINUS NIGRA Marsh. In swamps and wet grounds. (Porter.)
LIGUSTRUM VULGARE L. Escaped from cultivation. (Porter.)

GENTIANACEAE

ERYTHRAEA CENTAURIUM (L.) Pers. In waste places, Nazareth. (Porter.)
SABBATIA ANGULARIS (L.) Pursh. In rich soil. (Porter.)
GENTIANA CRINITA Froel. In moist woods and meadows in Monocacy valley, Sept. 28, 1897. (G. W. Caffrey.)
GENTIANA QUINQUEFOLIA L. In dry rocky soil along L. V. R. R. near South Bethlehem. Sept. 28, 1896.
GENTIANA ANDREWSII Griseb. In moist soil. (Porter.)
OBOLARIA VIRGINICA L. In woods between Bethlehem and Nazareth; also on Lehigh Mt. May, 1899.
BARTONIA IODANDRA Robinson. Specimens doubtfully referred here have been found in Northampton county. (Porter.)

APOCYNACEAE

APOCYNUM ANDROSAEMIFOLIUM L. In fields and thickets, Bethlehem. July 1' 1900.
APOCYNUM CANNABINUM L. In fields and thickets. (Porter.)
APOCYNUM ALBUM Greene. On river shores. (Porter.)

ASCLEPIADACEAE

ASCLEPIAS TUBEROSA L. In dry stony thickets, 1 mile east of Bethlehem.
ASCLEPIAS DECUMBENS L. In dry fields. (Porter.)
ASCLEPIAS INCARNATA L. In meadows along Monocacy creek and along bank of Lehigh river near Bethlehem. July 15, 1899.
ASCLEPIAS PULCHRA Ehrh. In moist fields and swamps. (Porter.)

Asclepias variegata L. In dry woods or thickets. (Porter.)
Asclepias quadrifolia Jacq. In copse on Lehigh Mt. May 30, 1896. Altitude 900 feet.
Asclepias Syriaca L. Common in uncultivated fields and along roadsides, Bethlehem.
Asclepias verticillata L. Dry hills and fields. (Porter.)
Acerates viridiflora (Raf.) Eaton. In dry, sandy or rocky soil. (Porter.)

CONVOLVULACEAE

Quamoclit coccinea (L.) Moench. Along river banks in waste places. (Porter.)
Ipomoea pandurata (L.) Meyer. In dry soil. Bethlehem.
Ipomoea purpurea (L.) Roth. In waste places, Bethlehem.
Ipomoea hederacea Jacq. In waste places, Bethlehem.
Convolvulus sepium L. In waste places and hedges, Bethlehem. Sept. 7, 1899, also at Portland.
Convolvulus Japonicus Thunb. Escaped from cultivation. (Porter.)
Convolvulus spithamaeus L. In clearing on Lehigh Mt. June 1, 1903, ascending 900 feet. (G. W. Caffrey.)
Convolvulus arvensis L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.

CUSCUTACEAE

Cuscuta Epithymum Murr. Usually on clover. (Porter.)
Cuscuta Cephalanthi Engelm. On shrubs and tall herbs. (Porter.)
Cuscuta Gronovii Willd. Common on herbs in moist places along Lehigh canal, Bethlehem.

HYDROPHYLLACEAE

Hydrophyllum virginicum L. In thickets along Saucon creek 2 miles from its mouth.

BORAGINACEAE

Heliotropium europaeum L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.
Cynoglossum officinale L. On dry hillsides, Lehigh Mt. Altitude 850 feet. May 30, 1896.
Lappula virginiana (L.) Greene. In dry soil, Bethlehem. July 15, 1899.
Mertensia virginica (L.) DC. In low meadows and along streams. (Porter.)
Myosotis laxa Lehm. Along mountain streams, Lehigh Mt. near South Bethlehem. May 30, 1898.
Myosotis arvensis (L.) Lam. In fields. (Porter.)
Myosotis virginica (L.) B. S. P. On dry hills and banks. (Porter.)
Lithospermum arvense L. On dry hillsides, Lehigh Mt. May 12, 1900.
Lithospermum canescens (Michx.) Lehm. In dry soil. (Porter.)
Symphytum officinale L. In waste places. (Porter.)
Echium vulgare L. In ballast on C. R. R. of N. J. tracks and in dry soil along Lehigh canal, Bethlehem.

VERBENACEAE

Verbena urticifolia L. In waste places, Bethlehem.
Verbena hastata L. In moist grounds along Monocacy creek, Bethlehem.
Verbena angustifolia Michx. In dry fields. (Porter.)

LABIATAE

Teucrium canadense L. In moist soil, Bethlehem. July 22, 1899.
Isanthus brachiatus (L.) B. S. P. In ballast along C. R. R. track 1 mile east of Bethlehem. Sept. 4, 1899.

TRICHOSTEMA DICHOTOMUM L. In ballast along C. R. R. of N. J. tracks near Glendon. Aug. 25, 1902.

SCUTELLARIA LATERIFLORA L. In meadows in Monocacy valley; along mountain stream on Lehigh Mt. Aug. 12, 1899, altitude 850 feet; along bank of Lehigh river at Island Park.

SCUTELLARIA PILOSA Michx. In woods on Lehigh Mt. July 1, 1899.

SCUTELLARIA PARVULA Michx. In moist sandy soil. (Porter.)

SCUTELLARIA GALERICULATA L. In swamps and along streams. (Porter.)

MARRUBIUM VULGARE L. In waste places. (Porter.)

AGASTACHE NEPETOIDES L. In thickets along Monocacy creek. Aug. 12.

AGASTACHE SCROPULARIAEFOLIA (Willd.) Kuntze. In woods and thickets. (Porter.)

NEPETA CATARIA L. In waste places, Bethlehem.

GLECOMA HEDERACEA L. In waste places, Bethlehem. May 8, 1899.

PRUNELLA VULGARIS L. In fields, waste places and along roadsides, Bethlehem.

LEONURUS CARDIACA L. In waste places along Delaware river several miles below Easton. June 11.

LAMIUM AMPLEXICAULE L. In fields and thickets near Bethlehem. May 7, 1899.

LAMIUM MACULATUM L. Along roadsides. Escaped from cultivation. Bethlehem. June 3, 1901.

STACHYS PALUSTRIS L. In moist soil. (Porter.)

SALVIA LYRATA L. In dry, mostly sandy soil and thickets. (Porter.)

MONARDA DIDYMA L. In moist soil, along Delaware river above Easton. (Porter.)

MONARDA CLINOPODIA L. In woods and thickets. (Porter.)

MONARDA FISTULOSA L. On dry hills and in thickets. (Porter.)

MONARDA MEDIA Willd. In moist thickets above Easton. (Porter.)

MONARDA MOLLIS L. In dry soil. (Porter.)

BLEPHILIA CILIATA (L.) Raf. In dry woods and thickets. (Porter.)

HEDEOMA PULEGIOIDES (L.) Pers. In dry soil on Lehigh Mt. near Lehigh University, altitude 800 feet; also along Monocacy creek, July 20.

MELISSA OFFICINALIS L. In waste places, thickets and woods. (Porter.)

CLINOPODIUM VULGARE L. In fields 1 mile north of Bethlehem. July 10, 1899.

ORIGANUM VULGARE L. In fields and waste places. (Porter.)

KOELLIA FLEXUOSA (Walt.) MacM. In fields and thickets. (Porter.)

KOELLIA VIRGINIANA (L.) MacM. In fields along Monocacy creek near Bethlehem. Aug. 12.

KOELLIA VERTICILLATA (Michx.) Kuntze. In dry fields and thickets. (Porter.)

KOELLIA CLINOPODIOIDES (T. & G.) Kuntze. In dry soil. (Porter.)

KOELLIA INCANA (L.) Kuntze. Dry hillsides and thickets. (Porter.)

KOELLIA MUTICA (Michx.) Britton. In sandy soil at Island Park. Aug. 25, 1902.

CUNILA ORIGANOIDES (L.) Britton. In dry woods, Lehigh Mt. (J. A. Ruth.)

LYCOPUS VIRGINICUS L. In moist soil on bank of Lehigh river at Bethlehem.

LYCOPUS COMMUNIS Bicknell. In moist soil. (Porter.)

LYCOPUS AMERICANUS Muhl. In moist soil along Lehigh river, Bethlehem. July 15, 1899.

MENTHA SPICATA L. In wet soil and in waste places, Bethlehem. July 22, 1899.

MENTHA PIPERITA L. In meadows along Saucon creek and along Monocacy creek.

MENTHA LONGIFOLIA (L.) Huds. In waste places. (Porter.)

MENTHA ROTUNDIFOLIA (L.) Huds. In waste places, Bethlehem.

MENTHA CRISPA L. In swamps and roadside ditches. (Porter.)

MENTHA ARVENSES L. In dry waste places. (Porter.)

MENTHA GENTILIS L. In waste places and along streams. (Porter.)

MENTHA SATIVA L. In waste places, Bethlehem. July 22, 1899; also at Easton.

Mentha canadensis L. In moist sandy soil along Lehigh river, Bethlehem. Aug. 5, 1899. Along Delaware river above Easton.
Collinsonia canadensis L. In woods on Lehigh Mt. July 22, 1899.
Perilla frutescens (L.) Britton. In waste places as an escape at Easton. (Porter.)

SOLANACEAE

Physalodes physalodes (L.) Britton. In waste places, escaped. (Porter.)
Physalis Philadelphica Lam. In waste places, Bethlehem.
Physalis virginiana Mill. In rich soil and open places. (Porter.)
Physalis virginiana intermedia Rydberg. (Porter.)
Physalis heterophylla Nees. In rich soil, Bethlehem.
Solanum nigrum L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.
Solanum carolinense L. In sandy soil along Lehigh river at Bethlehem. Aug. 5, 1899.
Solanum Dulcamara L. In moist soil along Monocacy creek, Bethlehem. July 6, 1898, also at Portland.
Lycopersicon Lycopersicon (L.) Karst. In waste places, escaped, Bethlehem.
Datura Stramonium L. In fields and waste places, Bethlehem. Sept. 28, 1896.
Datura Tatula L. In fields and waste places, Bethlehem.
Nicotiana rustica L. In fields and waste places. (Porter.)
Nicotiana longiflora Cav. Escaped from gardens, Easton. (Britton & Brown Vol. 3, p. 141.)
Petunia axillaris (Lam.) B. S. P. In waste places. (Porter.)
Petunia violacea Lindl. In waste places, escaped. (Porter.)

(*To be concluded.*)

SHORTER NOTES

On the Identity of *Dolichos unguiculatus* Linnaeus.—In the first edition of the Species Plantarum Linnaeus described a plant from Barbados as *Dolichos unguiculatus*, the binomial being based on an earlier description in the Hortus Upsalensis, 1748, p. 214. The original description in the latter work is as follows:

"Dolichos leguminibus subcylindraceis capitatis: acumine recurvo concavo.
Phaseolus barbadensis, siliqua tenui recta, semine ex purpuro nigricante.
Habitat in *Barbados*.
Hospitatur in *Caldario*, annua.
Obs. *Flos purpureus est.*"

It appears from this description that the plant was grown in the hothouse at Upsala, the seed having been obtained from Barbados.

In 1770, Jacquin (Hort. Vind., 1, pl. 23) published a colored plate of what he regarded to be Linnaeus's *Dolichos unguiculatus*. It is not apparent how Jacquin was misled, but the plant he figured is the catjang (*Vigna catjang*), very often regarded as a variety of the cowpea (*Vigna sinensis*).

In 1842, Walpers, Rep. 1: 779, transferred Linnaeus's species to *Vigna* as *Vigna unguiculata*, with little doubt basing his idea of its identity on the colored plate of Jacquin, though in the meantime the name of Linnaeus had been already taken up by some authors as the oldest name of the cowpea, for example by Guillemin, Perrotet and Richard, Flora Senegamb. Tent. 1830–33.

In many floras *Vigna unguiculata* is quoted as a synonym of *Vigna sinensis* (in a broad sense), and I have been able to find no single instance where it has been otherwise employed.

It was a matter of some surprise, therefore, upon examining Linnaeus's original specimen preserved in the Herbarium of the Linnaean Society, London, to find that it is not the cowpea at all, nor indeed a very close relative. It is in fact the plant recently described by Urban as *Phaseolus antillanus* (Symb. Ant. 4: 309). As the species seems properly referable to *Phaseolus* it will have to bear the name **Phaseolus unguiculatus** (L.). The following collections represent *Phaseolus unguiculatus:* Cuba, Wright, No. 1594, "in Cuba orientale," Sept. 1859–Jan. 1860; Porto Rico, P. Sintenis, No. 2938, Dec. 2, 1885; St. Vincent, H. H. & G. W. Smith, No. 1181, March, 1890.

C. V. Piper

CURRENT LITERATURE

A Supposed Fossil Fern Becomes a Pine Tree.—In a recent number of the *Annals of Botany* (**25**: 903–907. O. 1911) Dr. Marie C. Stopes has printed an interesting paper under the title: "On the True Nature of the Cretaceous Plant *Ophioglossum granulatum* Heer." In this paper Doctor Stopes has conclusively shown that the American specimens of this species, which was named and described originally by Heer from the Patoot beds of Greenland, and later identified by Newberry in the stratigraphically similar Amboy Clays of New Jersey, is not a fern at all but represents the staminate strobile (aments) of *Pinus*. By carefully dissecting some of the so-called granules of the fruit-spike Doctor Stopes was able to demonstrate the presence of numerous winged pollen grains characteristic of certain of the Pinaceae, especially *Pinus*, and these in conjunction with the association on the specimens of what are with little doubt the leaves of *Pinus*, make its reference to this genus reasonably certain.

Thus far no exception can be taken to the paper, but in the discussion which attends the discovery of the pollen grains, Doctor Stopes, by an ingenious arrangement of quotations, has made it appear that Doctor Newberry was inclined to regard the plant in question as actually referable to *Ophioglossum*. In order, therefore, that Doctor Newberry's views may be made perfectly clear, the following quotation (Fl. Amboy Clays, Monog. U. S. Geol. Surv., **26**: 43. 1895), which represents his whole statement of the subject, is given entire: "Professor Heer has described and figured a peculiar fossil which he regards as the fertile stipe of a fern and compares with the fertile frond of *Ophioglossum vulgatum*. Of this organism numerous examples have been found in the Amboy Clays, two of which are now figured. There can be no mistake about the identity of the plant, but as to its true character there may be great differences of opinion. Most of the specimens show at the base of an ament-like fruit spike one or more slender linear leaves or bracts, which evidently spring from the same stem. These leaves are sometimes as long as the fruit spike or longer, *and to me they seem like the male ament of a conifer rather than the fruit of a fern.*"*

Extended comment is unnecessary. This shows conclusively that Newberry had correctly diagnosed the probable biologic affinity of the organism and simply wished to call attention to the fact that the Patoot beds of Greenland and the Amboy Clays of New Jersey held this species in common. That this correlation is probably correct is attested by a much larger series of specimens than passed under the observation of Doctor Stopes.

* The italics are the reviewer's.

Toward the close of her paper Doctor Stopes indulges in what she is pleased to call certain "moral reflections as to the value of most determinations of fossil plant impressions," and is distressed to conclude that many of these determinations are wholly without proper biologic authenticity. As a means for separating the sheep from the goats Doctor Stopes proceeds as follows: "It seems a good opportunity to urge that the lists published by paleobotanists should be printed in two forms, and that the names of species of leaves, stems, etc., of which there is a reasonable security of determination, should be differentiated from those in which there is no guarantee at all that the actual nature of the plant has been discovered. Any tri-nomial system is cumberous, but those who publish on fossil plants might print their names in type of two kinds, which would indicate which species were doubtful. I would like to suggest that, instead of using italic or ordinary capitals, as is usual in printing the names of species and genera, such doubtful plant impressions should be printed in Gothic lettering. This would indicate that our knowledge about them is mediaeval, of the Dark Ages, and would further save the inconvenience of tri-nomials, while it would indicate immediately the difference between the established and the doubtful determinations. As information occurred about a specimen it could readily be transferred to the clear Latin italics."

Applying this suggestion to *Ophioglossum granulatum* Heer, she adds: "Any worker in another branch of science, seeing **O. granulatum** in Gothic, would be warned at least to look into the grounds for the determination for himself before he—let us imagine—used the record for his stratigraphic work in correlating horizons or in writing up the early history of Ophioglossaceae."

This statement shows not only an astonishing misconception of what a tri-nomial means, and the principles and uses of stratigraphic paleobotany, but leads to interesting speculations as to the practical application of the plan. Suppose, for example, we have a fossil plant in which the genus is known with practical certainty, but we are troubled to decide whether the species is a living one (such an example is afforded by the Fort Union *Corylus americana*). Shall we print the genus in Italic and the species in Gothic? Suppose we can be certain that one of Heer's plants from Greenland is the same as one found in the Amboy Clays, but we are still in doubt as to the generic reference. Shall we write the genus in Gothic and the species in Italic? And, when all is said and done, who shall be the censor to pass upon the authenticity of the biologic references? Shall we have a high court of appeal to decide when a species is entitled only to Gothic type, or when it is to be permitted to graduate into Italic or full capitals?

Although Doctor Stopes has thoughtfully confined these "moral reflections" to plant impressions only, we can not help thinking that the proposed reform, if adopted, ought also to apply to genera or species founded or identified on internal structure. For instance, would it not be as well to print *Niponophyllum cordaitiforme* Stopes & Fujii in Gothic, pending the decision as to whether it belongs to the Araucarineae, Podocarpineae, Cycadaceae or Cordaitales? Or would it be out of place to "Gothicize" *Cretovarium japonicum* of the same authors until it can be determined whether it is a Monocotyledone or a Dicotyledone?—A. Hollick.

The Indiana Weed Book.—This work by W. S. Blatchley is a piece of botany segregated upon the basis of the subjects being troublesome to the crop grower. So much that can be said of weeds applies with more or less force to other plants that the discussion of the distribution of their seeds by winds, water, birds and passing animals becomes a bright chapter in plant ecology. In the classification of weeds into (1) those of the worst type, (2) less aggressive, and (3) comparatively harmless, the author has not overlooked the benefits that those pests confer by the green covers they provide and the stimulus for better tillage. Apropos of this there are many pages devoted to the best methods of weed extermination, beginning with "(1) Sow clean seeds" and running through crop-rotation, autumn plowing, fewer fences, spraying, etc., to "(15) Make botany a common school study."

Following directly upon this very practical portion, and all sprinkled with the spice of poetry, is a consideration of the root, stem, leaf, flower, and fruit of weeds, thus preparing the student along strictly botanical lines for the use of the descriptive catalog that makes up the main portion of the work. As a rule the species—arranged by families according to Britton and Brown's Flora—are illustrated by cuts well chosen from many sources.

It is quite clear from this little book—deserving more than a paper cover—that weeds provide a subject of great variety for the study of plants in the many phases of their existence, whether that extends over only a few weeks or through many years. While written especially for Indiana the author has provided a handbook from which any one can gain an interesting and profitable familiarity with many of our more common plants.—B. D. Halstead.

Dunn, S. T., & Tutcher, W. J. Flora of Kwangtung and Hongkong (China). Kew Bull. Misc. Inf. Addit. Ser. 10: 1–370. Map. 1912.—Kwangtung contains about 68,000 square miles, about one half within the tropics. There is a moderate range in elevation, from sea-level to 3,000 feet, with a few higher mountains about which little is known. The area of Hongkong is only 30 square miles, largely hilly, but it has been carefully explored. Many parts of the mainland are imperfectly known, especially in the southwest; nevertheless, its flora has been more accurately ascertained than that of any other part of China. It may be summarized as follows:

	Families	Genera	Species
Dicotyledons	117	728	1,749
Monocotyledons	25	232	557
Gymnosperms	3	7	11
Pteridophytes	15	42	243
	160	1,009	2,560

The sequence and limits of families are those of Bentham and Hooker; had Engler and Prantl been followed, the number of families would be stated as 181. In practically all cases, the authors have adhered to the nomenclature of the Index Kewensis.

But the book is most noteworthy for other reasons. It is the first which a student of the flora of any province of China can use to identify its plants, for it is provided throughout with keys to families, genera, and species. Indeed, no similar work has yet been completed for any other part of the Far East. A quite unique feature is the combination, in certain cases, of genera of similar habit in a single key.*

The largest family is Leguminosae with 66 genera and 173 species; then follow in order Gramineae, 76 genera, 166 species; Cyperaceae, 21 genera, 126 species; Compositae, 50 genera, 117 species; Orchidaceae, 44 genera, 89 species; Euphorbiaceae, 33 genera, 88 species; Rubiaceae, 34 genera, 86 species; Urticaceae, 25 genera, 70 species; these families taken in the wide sense.

The nearest extra-Chinese regions to Kwangtung are Formosa on the east, the Philippines on the southeast, and Indo-China on the southwest. With the last the transition in floras is probably very gradual, as continues to be the case through Tonkin and Annam into Cochin-China and Cambodia. There is also great similarity between the floras of Kwangtung and Formosa, many of the differences being due to the high mountains of the latter. The distance from eastern Kwangtung to the nearest point in the Philippines is only two thirds of the width of the Chinese province, or one third the length of the Islands, but the flora of the two political divisions is quite different. For example, the numericial order of phanerogamic families in the Philippines is Orchidaceae, Rubiaceae, Leguminosae, together having about 750 more known species than Kwangtung; pteridophytes, also, are three times as numerous. An area less than twice as great cannot accountfor this; the explanation must be sought in higher mountains, and tropical profusion.

It has been found necessary to describe only 15 species as new. This is partly due to earlier publications by the authors themselves as well as by others, for Hongkong alone has 100 endemic species; in part it must be attributed to the fact that

[* By a curious coincidence, and in a widely separated locality, the same procedure has just been followed in the recent admirable flora of the pine barrens by Witmer Stone.—Ed.]

the plants have come from moderate elevations in one portion of a great continent. The work will be of much value to botanical workers in many countries other than that for which it is primarily intended.—C. B. Robinson.

Smith's Bacteria in Relation to Plant Diseases.*—This is the second volume of Dr. Smith's publication and follows the first after an interval of six years. The earlier part discussed the general properties of bacteria, the methods of bacteriological research and so on. It has also proved to be a store-house of useful data and bibliographies. The present volume deals more particularly with the problems of the bacterial pathology of plants, with special reference to the vascular diseases. A great deal of space is given to the consideration of such subjects as the channels of infection in plants, the nature of parasitism, immunity factors, the normal bacterial flora of higher plants, and plant hygiene. All of these topics and many more are handled in the author's chatty and interesting manner. His own high position in his science makes it possible for him to speak in a personal way of many things, for there are few phases of the subject that he has not studied in his long and active career. The difficulty he once found in obtaining recognition for the idea that bacteria may cause disease in plants is echoed in the following paragraph quoted from him.

"The objections to bacterial parasitism in plants have been objections coming from those not familiar with such phenomena, and we all know how difficult it is at first for new ideas to make their way. Such things could not happen because they had not come within the ken of the objector, or because the physical nature of plant-tissues offered (theoretically) an insuperable obstacle to their multiplication, or because plant juices were acid and all known bacteria required an alkaline medium, or because if such diseases existed, one would already have discovered them. All of these objections were the result of inductions based on insufficient evidence. A thousand observations, let us say, con-

* Smith, Erwin F. Bacteria in Relation to Plant Diseases, Vol. II, pp. 1–368. Publication 27, Vol. II, Carnegie Institution of Washington. 1911.

firmed them, but then the thousand and *first* upset them completely."

An English reviewer has objected to the amount of space given by Dr. Smith to the nitrogen bacteria, ginger-beer plant, etc., and also to the full abstracts of other investigators' papers. Now, it seems that neither of these objections is very serious for two reasons: first, the publications of the Carnegie Institution are not intended to be used as text-books by undiscriminating young students but are for specialists who can choose those things in a book that are of most use to them in their own immediate problems; secondly, very few of us are able to read foreign languages with such ease that we *prefer* to do so and, furthermore, to have these abstracts brought together in one place is a saving of time. The author's style of informal discussion increases the readableness of the book, a result not to be scorned even in a scientific publication.

On the whole one may say that this volume is one well worth reading by people interested in botanical, bacteriological or phytopathological matters even if a highly technical knowledge of these subjects is not possessed. To the specialist in this field it should be an inspiration and a mine of valuable data. It is hoped that a third volume will soon appear in which we may find the brilliant researches of Dr. Smith and his co-workers upon the plant tumors.—E. D. C.

PROCEEDINGS OF THE CLUB

March 27, 1912

The meeting of March 27, 1912, was held in the lecture room of the New York Botanical Garden at 3 P.M. Vice-President Barnhart presided. Forty persons were present.

The minutes of the meetings of February 28 and March 12 were approved. The resignations of Mrs. M. E. Soth and F. K. Vreeland were read and accepted and Dr. R. Ellsworth Call, Geo. E. Hastings, and Frank M. Wheat, of the DeWitt Clinton High School, New York City, were elected to membership.

The announced scientific program consisted of a lecture on "Organization of Pediastrum Colony" by Professor R. A. Harper. The lecture was illustrated with lantern slides.

Meeting adjourned.

B. O. Dodge,
Secretary

April 24, 1912

The meeting of April 24, 1912, was held in the Laboratory of the New York Botanical Garden at 3:15 P.M., Dr. W. A. Murrill presiding. Fifteen persons were present.

The announced scientific program consisted of a paper on "Plant Hairs," by Dr. William Mansfield.

The speaker exhibited a number of figures representing various types of plant hairs and showed how the four main types, simple, compound, septate and non-septate, could be made the basis of a key by which many species of plants could be identified.

Meeting adjourned.

B. O. Dodge,
Secretary

May 14, 1912

The meeting was held in the American Museum of Natural History at 8:15 P.M. President Burgess presided. Nine persons were present.

The scientific program consisted of an illustrated lecture on "Dr. Charles H. Shaw's Botanical Studies in the Selkirks," by Miss Caroline S. Romer.

Meeting adjourned.

B. O. Dodge,
Secretary

NEWS ITEMS

At a recent meeting of the New York College of Pharmacy the treasurer, Mr. C. O. Bigelow, introduced an amendment to the by-laws, at the request of Dean Rusby, providing for the appointment of an associate dean, in order that the dean might be relieved of a great deal of minor detail work, which at present devolves upon him. In some strange way the daily press reported this as a resignation by Dr. Rusby of the dean's office, and this report has been widely copied in other periodicals. It is here worthy of note, that after several years' effort on the part of the authorities of the College of Pharmacy, they have at last succeeded in establishing, in addition to the two year course, designed to prepare students for the work of the retail pharmacy, an advanced course, consisting of four years' work, for which the degree of Bachelor of Science in Pharmacy will be conferred by Columbia University. Two years of additional work will lead to the degree of Doctor of Pharmacy, which places the degree on the same professional footing as that of M.D. This arrangement has been approved by the Education Department of the State of New York, and will hereafter constitute the state requirements for these degrees.

William Robertson Smith, since 1854 superintendent of the National Botanic Garden at Washington, D. C., died on July 7th. He was born at Athelstone Falls, Scotland, March 21, 1828, and came to this country from the Royal Botanic Gardens at Kew, in 1853. Ever since he has been prominently identified with the National Botanic Garden, which holds a unique position among botanic gardens in this country. Mr. Smith possessed what is probably the finest collection of Burnsiana extant.

Prof. F. E. Lloyd until recently professor of botany at the Alabama Polytechnic Institute has been appointed professor of botany at McGill University, Montreal. Prof. Lloyd, who is now carrying on research work at the Carnegie Institution at Tucson, will begin work at his new post about September 1st.

An interesting acquisition to American botanical libraries is the recent purchase by the New York Botanical Garden of a copy of "Jacquin's Selectarum Stirpium Historia Iconibus Pictis." This, said to be the most valuable single volume in modern botanical literature, contains 264 colored plates, and descriptions of many tropical american plants. Only 12 or at least not more than 18 copies of this work were ever printed.

The edition which has been acquired by the New York garden was issued about 1780 or 1781. Only one other copy is known in America, at the Library of Congress at Washington.

Dr. E. de Wildman, for many years connected with the botanic garden at Brussels, and well known for his studies on economic botany and the flora of Tropical Africa, has been appointed director of the garden.

We learn from the *Sun* that on the 24th of July, Prof. J. A. Paine died at Tarrytown, N. Y., after several years of rather poor health. He was born in Newark, N. J., January 14, 1840. Prof. Paine specialized in botany and biology and was employed by the Board of Regents of the State of New York in connection with the flora of the State in 1862–67.

In 1867–69 he was professor of natural science in the Robert College (Congregational) in Constantinople, Turkey, and during 1870–71 professor of natural history and German in the Lake Forest University in Illinois.

During 1871–72 he was the editor of the *Independent* in New York and in 1872–74 he went with the first expedition of the Palestine exploration society east of the Jordan and Red Sea in the capacity of archeologist. One of his best known botanical works was a "Catalogue of Plants found in Oneida County and vicinity," printed in 1865.

On Thursday evening, August first, twelve botanists were the guests of Dr. N. L. Britton at a dinner given in honor of Dr. Chas. E. Bessey. After a walk through the grounds and conservatories of the New York Botanical Garden the party dined at L'Hermitage, where congratulatory speeches were made by several of the company after Dr. Bessey's speech to the toast "Nestor of American Botany."

The advantages of originally publishing such items in a magazine devoted solely to the science of botany, and also the protection afforded American botanists from prematurely or incorrectly published press dispatches, are features which, it is hoped, will be found sufficiently attractive to ensure hearty coöperation.

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BY

NORMAN TAYLOR

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CONTENTS

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THE TORREY BOTANICAL CLUB

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THE DETERMINATION OF WOODS*

By Chester Arthur Darling

As an introduction to this key to the commercial timbers it seems desirable to give a few directions and to define a few terms. The wood of a tree, like the leaves, is often variable; this variation is seen in the width of the growth rings, in the texture, and in the color of the wood which may be due to its being either sap or heart wood or to the length of time that it has been exposed after being cut.

For determination of any wood, a sample at least an inch square in cross section and three inches in longitudinal section should be used; a larger piece often shows the characters better than a small one. In using the key a hand lens which magnifies at least four times and a sharp knife which will make a clean cut surface in cross section of the wood without tearing the tissue are necessary. Unless otherwise indicated the section cut crosswise of the grain is the one to be examined. When color is to be determined the longitudinal section which has been freshly cut and not the cross section should be used; it is always best to test for color by placing the wood against a white surface.

Growth rings are indicated by parallel markings more or less curved which are seen on the cross section of the wood, usually varying in width from $\frac{1}{32}$ in. to $\frac{1}{4}$ in.; in the cross section of the tree they appear as concentric rings. Where there are parallel markings of two distinct types alternating, one of harder or more compact wood than the other, the two taken together

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* Suggestions for improving the key as well as corrections and additions will be gladly accepted; specimens of wood may be obtained upon request; additional copies of the key may be secured for 10 cents by addressing the author at Columbia University, New York City.

indicate a single growth ring; the inner part of the segment of the ring which is either more porous or less compact indicates the spring wood, while the outer portion which is often less porous or more dense is the summer wood; each growth ring is made up of both spring and summer wood, the inner part always being the spring wood. In some of the pines the spring and the summer wood are distinguished from each other as two distinct bands; whereas in some woods there is a gradual transition from the spring to the summer, and in still other cases there is no apparent difference between the two.

The pith rays always appear as lines of compact wood in the cross section extending at right angles to the growth rings; in longitudinal radial section they appear as smooth patches at right angles to the parallel bands of the spring and summer wood. When the pith rays are very small, wetting the cross section will often cause them to be more easily seen.

The pores are small openings usually no larger than that caused by the prick of a pin; they are plainly visible with a magnifier on a cross section which is clean-cut, in some cases they may be seen without the aid of a magnifier. In the Black Locust and sometimes in the Thorny Locust these large pores are filled with cellulose material. The pores in the summer wood arranged *radially* will be at right angles to the growth rings, whereas those arranged *concentrically* will be parallel to the growth rings. To determine *a* or *b* of 19 it is always desirable to make as thin a cross section as possible with a sharp knife, hold the section up to the light, and by looking through it one can easily determine whether or not the cells are arranged in regular rows.

Resin ducts appear as very small dots in cross section; the surface of the wood must be clean-cut without any tearing of the tissue in order that one may be sure of the presence of the ducts; it is usually best to wet the wood *after* making the section, since wetting will cause the duct to be more easily seen. It is usually of a lighter color than the surrounding wet tissue.

The characteristics of odor and of taste can be used to advantage only after one has handled different kinds of wood; a *characteristic* odor or taste refers to one which is not commonly found in many woods. As to the texture, whether hard or soft, experience again is the best guide; however if a wood can be easily indented with the finger nail it may be called a soft wood; weight as here used is comparative and can be determined only by using different kinds of wood. As in the use of any key the more one knows, the easier it is to use.

In using the key always begin with number 1, read both *a* and *b*; after determining in which group the particular specimen belongs turn to the number indicated and read both *a* and *b*, choosing the one which best describes the specimen; continue this process until the name is secured. Accuracy in observation and in following the key is of first importance.

1 *a*. In smooth cross section growth rings are conspicuously marked by a zone of large pores collected in the spring wood, alternating with a zone of denser summer wood with smaller pores; pores usually visible without magnifier. . . . . .2.

b. In smooth cross section the growth rings are not marked by a zone of large pores in the spring wood as in *a*. . . . . .15.

2 *a*. Pith rays comparatively broad, at least as broad as the large pores, conspicuous without magnifier; radiating and branching lines or patches in the summer wood. . . . . .3.

b. Woods not completely as in *a*. . . . . .4.

3 *a*. Wood with reddish tinge. . . . . **Red Oaks.** (*Quercus.*)

b. Wood dingy, not with reddish tinge. . . . . **White Oaks.** (*Quercus.*)

4 *a*. Wood golden-colored or yellowish-brown; numerous smaller pores in summer wood appearing, without magnifier, as lighter colored specks or lines. . .5.

b. Wood not golden or yellowish. . . . . .6.

5 *a*. Pores in summer wood single or in small groups, not in conspicuously concentric lines; pith rays fine, conspicuous only with magnifier; large pores often filled. . . . .**Black Locust.** (*Robinia pseudacacia.*)

b. Pores in summer wood usually in clusters appearing as irregular, concentric lines; pith rays conspicuous without magnifier. . . . . . **Mulberry.** (*Morus.*)

6 *a*. Wood reddish, pink, or salmon-colored; pores in summer wood conspicuous, often arranged in irregular concentric lines; pores in spring wood usually in two or more rows, the large pores sometimes filled.
Thorny Locust. (*Gleditsia triacanthos.*)

b. Wood not completely as in *a*. . . . . .7.

7 *a*. Pores in summer wood small, appearing as conspicuous concentric, wavy lines, sometimes continuous, often rail-fence like; wood comparatively light in weight. . . . . .8.

b. Pores in summer wood not completely as in *a*. . . . . .9.

8 *a*. Wood greenish-white; the large pith rays often as broad as the large pores.
Hackberry. (*Celtis.*)

b. Wood not greenish-white; pith rays not as broad as the large pores.
Elm. (*Ulmus.*)

9 *a*. Numerous fine straight, concentric lines nearly as distinct as the pith rays appear in the summer wood; pores often with a wall lighter colored than the surrounding tissue; wood heavy and hard....... **Hickory.** (*Hicoria.*)

b. Wood not completely as in *a* .... 10.

10 *a*. Pores in summer wood very small, appearing as radial branching lines or spots, often indistinct; pith rays very fine, usually visible only with the magnifier............................ **Chestnut.** (*Castanea dentata.*)

b. Pores in summer wood appearing as spots or as short broken lines, *not* radially arranged.. 11.

11 *a*. Wood when wet has a characteristic odor and taste; wood light.
Slippery Elm. (*Ulmus fulva.*)

b. Wood not completely as in *a*....................................... 12.

12 *a*. Wood red; pores in summer wood not arranged in lines, usually separate.
Coffee Tree. (*Gymnocladus dioica.*)

b. Wood not completely as in *a*....................................... 13.

13 *a*. Wood comparatively light; pores in spring wood large and numerous, usually in three or more rows, sometimes filled; pores in summer wood often several together....................... **Catalpa.** (*Catalpa Catalpa.*)

b. Wood not completely as in *a*....................................... 14.

14 *a*. Wood whitish; large pores in spring wood comparatively few, usually occupying not more than one third of the ring.
White Ash. (*Fraxinus americana.*)

b. Wood brownish; large pores in spring wood comparatively numerous, often occupying one half of the ring........ **Black Ash.** (*Fraxinus nigra.*)

15 *a*. Pores usually visible without magnifier, generally scattered through the ring but more numerous and larger in the spring wood, gradually varying to smaller ones in the summer wood................................ 16.

b. All pores small or minute, rather evenly distributed, usually visible only with magnifier.. 19.

16 *a*. Pith rays comparatively broad, the largest often twice as broad as the largest pores; pores often arranged in radial lines or patches.
Live Oak. (*Quercus virginiana.*)

b. Wood not completely as in *a*....................................... 17.

17 *a*. Wood dark chocolate brown............ **Black Walnut.** (*Juglans nigra.*)

b. Wood not dark chocolate brown, usually light brown to whitish; fine straight concentric lines appear in the summer wood...................... 18.

18 *a*. Wood comparatively hard and heavy; large pores with a wall lighter colored than the surrounding tissue.................. **Hickory.** (*Hicoria.*)

b. Wood comparatively light; large pores not as in *a*.
Butternut. (*Juglans cinerea.*)

19 *a*. Cells of different sizes, not arranged in regular compact radial rows as seen in thin cross section, sometimes visible without magnifier; pith rays often visible even without magnifier; growth rings sometimes indistinct.
20.

b. All cells of uniform size arranged in regular radial rows or tiers as seen in a thin cross section; pith rays very fine; growth rings always distinct, the summer wood often much harder than the spring wood............ 34.

20 *a*. Wood reddish-brown, streaked with irregular darker colored streaks or lines;

pores and pith rays very small often indistinct even with the magnifier; growth rings often inconspicuous.

Sweet Gum, Red Gum. (*Liquidambar Styraciflua.*)

b. Wood not completely as in *a* .... 21.

21 *a.* Pith rays scarcely visible even with magnifier; wood soft and light, often whitish, usually with a silky luster in a freshly-cut cross section; pores numerous and scattered...... **Cottonwood. Willow.** (*Populus. Salix.*)

b. Wood not completely as in *a.* .... 2.

22 *a.* Pith rays conspicuously varying in width in cross section, some half as broad as others, the rays usually conspicuous without magnifier; wood usually hard and heavy .... 23.

b. Pith rays not conspicuously varying in width as in *a* .... 25.

23 *a.* Wood appears mottled on radial section; pores usually visible without magnifier; wood usually vinous red..... **Sycamore.** (*Platanus occidentalis.*)

b. Wood not completely as in *a* .... 24.

24 *a.* Wood with a reddish tinge; broad pith rays numerous.

Beech. (*Fagus grandifolia.*)

b. Wood whitish; broad pith rays not numerous; growth rings usually wavy.

Blue Beech. (*Carpinus caroliniana.*)

25 *a.* Wood usually greenish-white, sometimes whitish when newly cut; pores small, numerous, crowded; wood light.

White Wood. Tulip Poplar. (*Liriodendron tulipifera.*)

b. Wood not completely as in *a* .... 26.

26 *a.* Wood usually light brown, sometimes whitish when newly cut; pores small, not crowded; wood comparatively soft and light.

Basswood. (*Tilia americana.*)

b. Wood not completely as in *a* .... 27.

27 *a.* Wood usually vinous red; pores numerous, scattered, conspicuous with magnifier, sometimes without; pith rays give a silvery grain on the radial section .... **Cherry.** (*Prunus serotina.*)

b. Wood whitish, yellowish, or reddish; pores few; pith rays often appear as reddish patches on the radial section .... 28.

28 *a.* Pith rays about as broad as the largest visible pores, plainly visible in cross section without magnifier; on radial section the largest pith rays appear about $\frac{1}{8}$ in. high; pores numerous and distinct .... 29.

b. The broadest pith rays about half as broad as the largest visible pores, often visible on cross section only with magnifier; on radial section the largest pith rays appear about $\frac{1}{32}$ in. high; pores often appear as whitish specks on cross section especially when wood is wet; wood usually of fine texture. 30.

29 *a.* The largest pith rays broader than the large pores; wood heavy and hard. **Hard Maples.**

b. The large pith rays about the same width as the large pores; wood of medium weight and texture.. **Soft Maples.**

30 *a.* Wood with reddish tinge .... 31.

b. Wood not with reddish tinge, either whitish, yellowish, or light brown.... 32.

31 *a.* Pores arranged in radial lines or patches; wood very hard and heavy.

Ironwood. (*Ostrya virginiana.*)

b. Pores scattered, not arranged as in *a*; wood of medium weight.
Red and **Cherry Birch.**

32 *a.* Growth rings very indistinct; pores minute and scattered.
Tulepo. Sour Gum. (*Nyssa sylvatica.*)

b. Growth rings clearly marked . . . . 33.

33 *a.* Wood distinctly yellow; pores numerous occupying nearly all of the space; wood light . . . . **Buckeye. Horse Chestnut.** (*Æsculus.*)

b. Wood whitish; pores occupying not over half the space; wood of medium weight . . . . **Gray Birch. White Birch.**

34 *a.* In freshly cut longitudinal section wood is decidedly chocolate-colored, reddish, or reddish-brown, not merely tinged with red; resin ducts always wanting . . . . 35.

b. Wood not completely as in *a* . . . . 37.

35 *a.* Wood with lead-pencil-like odor; wood comparatively heavy, hard and compact, fine grained . . . . **Red Cedar.** (*Juniperus virginiana.*)

b. Wood comparatively light and soft . . . . 36.

36 *a.* Wood reddish-brown, not with characteristic resinous odor.
Redwood. (*Sequoia.*)

b. Wood light chocolate brown with a characteristic, resinous, shingle-like odor.
Canoe Cedar. Incense Cedar. (*Thuja. Libocedrus.*)

37 *a.* Wood decidedly white in freshly-cut longitudinal section, comparatively soft and light . . . . 38.

b. Wood usually straw-colored or tinged with red, not noticeably white . . . . . 39.

38 *a.* A few small resin ducts present appearing as specks in smooth cross section when wood is wet . . . . **White** or **Black Spruce**. (*Picea.*)

b. Resin ducts wanting . . . . **Balsam Fir.** (*Abies balsamea.*)

39 *a.* Transition from spring to summer wood (not summer to spring) more or less abrupt; bands of summer wood marked from bands of spring wood by fairly well defined lines . . . . 40.

b. Transition from spring to summer wood gradual . . . . 49.

40 *a.* Resin ducts wanting . . . . 41.

b. Resin ducts present, seen as specks especially in the bands of summer wood when wood is wet . . . . 43.

41 *a.* Wood light brown, with characteristic, resinous, shingle-like odor when wet.
White Cedars. (*Thuja. Chamaecyparis.*)

b. Wood not with characteristic odor as in *a* . . . . 42.

42 *a.* Growth rings usually variable in width; wood when fresh with a soapy or greasy character; summer wood straw color.
Cypress. (*Taxodium distichum.*)

b. Growth rings more or less regular in width; summer wood brownish.
Western White Firs. (*Abies.*)

43 *a.* On freshly-cut section wood has a characteristic, resinous, turpentine-like odor when wet; wood heavy, hard, and resinous, rather fine grained.
Longleaf Pine. (*Pinus palustris.*)

b. Woods not completely as in *a* . . . . 44.

44 *a.* Summer wood somewhat orange-yellow as seen in tangential section; growth rings regular in width often wavy in appearance; resin ducts usually oblong

in cross section, usually in groups, often not very distinct; wood with a rather characteristic odor when wet; western species.

Douglas Spruce. (*Pseudotsuga Douglasii.*)

b. Woods not completely as in *a*. . . . . 45.

45 *a.* Average growth rings usually less than $\frac{1}{8}$ in. broad, more or less regular in width . . . . 46.

b. Some growth rings more than $\frac{1}{8}$ in. broad, often irregular in width . . . . 48.

46 *a.* Western wood; average growth rings about in. $\frac{1}{16}$ or less broad.

Bull Pine. (*Pinus ponderosa.*)

b. Eastern and southern woods; average growth rings more than $\frac{1}{16}$ in. broad. 47.

47 *a.* Wood noticeably reddish; transition from spring to summer wood often gradual in at least some of the rings. . . . . **Red Pine.** (*Pinus resinosa.*)

b. Wood not noticeably reddish; transition from spring to summer wood abrupt.

Short-leaved Pine. (*Pinus echinata.*)

48 *a.* Bands of summer wood distinctly marked from bands of spring wood on *each* side; adjacent rings often variable in width; some resin ducts often oblong in cross section . . . . **Loblolly Pine.** (*Pinus Taeda.*)

b. Some bands of summer wood distinctly marked from bands of spring wood only on *one* side of ring; resin ducts appear as circular dots in cross section; wood comparatively hard and heavy. . . . **Tamarack.** (*Larix laricina.*)

49 *a.* Wood light brown, soft, light, with a distinctly resinous, shingle-like odor when wet; resin ducts wanting; summer wood darker than the spring wood.

White Cedars. (*Thuja. Chamaecyparis.*)

b. Wood not completely as in *a* . . . . 50.

50 *a.* Resin ducts present appearing as specks especially when wood is wet . . . 51.

b. Resin ducts wanting, or not distinguishable . . . . 57.

51 *a.* Growth rings usually variable in width; wood when fresh with a soapy or greasy character; summer wood straw colored.

Cypress. (*Taxodium distichum.*)

b. Woods not completely as in *a*. . . . . 52.

52 *a.* Wood comparatively hard and heavy; some growth rings usually $\frac{1}{8}$ in. or more broad . . . . **Tamarack.** (*Larix laricina.*)

b. Wood comparatively soft and light . . . . 53.

53 *a.* Wood with a decidedly reddish tinge on longitudinal section when dry, not merely red in summer wood . . . . 54.

b. Wood not noticeably red on longitudinal section . . . . 55.

54 *a.* Eastern wood; transition from spring to summer wood often abrupt in some growth rings; sap wood often with bluish streaks.

Red Pine. (*Pinus resinosa.*)

b. Western wood; transition from spring to summer wood gradual in all of the growth rings. . . . . **Western White Pine.** (*Pinus monticola.*)

55 *a.* Resin ducts comparatively large often darker than the wood; wood often stained around the resin ducts; summer wood noticeably harder and darker than the spring wood; western wood . . **Sugar Pine.** (*Pinus Lambertiana.*)

b. Woods not completely as in *a*. . . . . 56.

56 *a.* Growth rings about $\frac{1}{16}$ in. or more broad; resin ducts conspicuous when wood is wet; wood with pine odor when wet; eastern wood.

White Pine. (*Pinus Strobus.*)

b. Growth rings about $\frac{1}{32}$ in. broad; resin ducts very small, few; western wood. **Engelman's Spruce.** (*Picea Engelmanni.*)

57 *a*. Average growth rings less than $\frac{1}{18}$ in. broad; cells often just visible with the magnifier in cross section; western woods......................58.

b. Average growth rings more than $\frac{1}{18}$ in. broad........................59.

58 *a*. Very small resin ducts appearing as tiny specks in cross section when wood is wet....................**Engelman's Spruce.** (*Picea Engelmanni.*)

b. No resin ducts present............................**Red Firs.** (*Abies.*)

59 *a*. Wood whitish, comparatively soft and light; eastern wood. **Balsam Fir.** (*Picea balsamea.*)

b. Wood dingy colored or with reddish tinge...........................60.

60 *a*. Growth rings regular in width, about $\frac{1}{8}$ in. broad; wood of fine texture; western species......................**Western White Firs.** (*Abies.*)

b. Growth rings usually variable in width; wood of rather coarse texture, often silvery on longitudinal section....................................61.

61 *a*. Eastern wood; spring wood light-flesh-color when wet; wood splintery. **Eastern Hemlock.** (*Tsuga canadensis.*)

b. Western wood; spring wood dark-flesh-color when wet; summer wood buff-colored on radial section......**Western Hemlock.** (*Tsuga Mertensiana.*)

COLUMBIA UNIVERSITY.

THE FLORA OF NORTHAMPTON COUNTY, PENNSYLVANIA

BY WILBUR L. KING

(*Continued from August* TORREYA)

SCROPHULARIACEAE

VERBASCUM THAPSUS L. In fields and waste places, Bethlehem. July 15. 1899.

VERBASCUM LYCHNITIS L. In fields and waste places. (Porter.) Fairly abundant along the Canal at Raubsville (J. A. Ruth)

VERBASCUM BLATTARIA L. Common in fields and waste places, Bethlehem.

LINARIA LINARIA (L.) Karst. Common in fields and waste places, Bethlehem.

ANTIRRHINUM ORONTIUM L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull Torrey Club, **19**: 10. 1892.

SCROPHULARIA MARYLANDICA L. In thickets along Lehigh River at Bethlehem. Aug. 5, 1899.

SCROPHULARIA LEPORELLA Bicknell. In woods and along roadsides. (Porter.)

CHELONE GLABRA L. In wet soil along Monocacy creek 2½ miles north of Bethlehem. Sept. 3, 1899.

PENTSTEMON HIRSUTUS (L.) Willd. In dry soil ½ mile west of Freemansburg. May 29, 1897.

PAULOWNIA TOMENTOSA (Thunb.) Baill. Escaped from cultivation along towpath ½ mile east of Bethlehem.

MIMULUS RIGENS L. In moist soil along Lehigh river near Bethehem July 15, 1899.

MIMULUS ALATUS Soland. In swamps. (Porter.)

GRATIOLA AUREA Muhl. In sandy wet places along Delaware river and at Bethlehem. (Porter.)

ILYSANTHES DUBIA (L.) Barnh. In wet places. (Porter.)
ILYSANTHES ATTENUATA (Muhl.) Small. In moist soil on banks of Lehigh river, Bethlehem. Aug. 22, 1899.
VERONICA ANAGALLIS-AQUATICA L. In brooks and swamps along the Delaware river above Easton. (Porter.) In wet soil at Portland.
VERONICA AMERICANA Schwein. In brooks and swamps. (Porter.)
VERONICA SCUTELLATA L. In swamps. (Porter.)
VERONICA OFFICINALIS L. In dry soil on Lehigh Mt.; also along Saucon creek. June 5, 1897.
VERONICA SERPYLLIFOLIA L. In woods near Lehigh University. (J. A. Ruth.)
VERONICA PEREGRINA L. Along roadsides, Bethlehem. May 20, 1900.
VERONICA ARVENSIS L. In woods on Lehigh Mt., altitude 850 feet. May 30, 1900.
VERONICA AGRESTIS L. On hillsides on Lehigh Mt. May 20, 1899.
VERONICA HEDERAEFOLIA L. In thickets, fields and waste places. (Porter.)
LEPTANDRA VIRGINICA (L.) Nutt. In meadows, moist woods and thickets. (Porter.)
DASYSTOMA PEDICULARIA (L.) Benth. In rocky woods, Wind Gap. Aug. 27.
DASYSTOMA FLAVA (L.) Wood. In woods on Lehigh Mt. July 20, 1899.
DASYSTOMA VIRGINICA (L.) Britton. In dry or moist woods. (Porter.)
GERARDIA PAUPERCULA (A. Gray.) Britton. In bogs and low meadows along Delaware river above Easton. (Porter.)
GERARDIA TENUIFOLIA Vahl. In dry woods, Nazareth. Sept. 7, 1901.
CASTILLEJA COCCINEA (L.) Spreng. In meadows in Lower Saucon township.
PEDICULARIS CANADENSIS L. In woods on Lehigh Mt. May 20, 1899.
MELAMPYRUM LINEARE Lam. In dry woods, Nazareth.

LENTIBULARIACEAE

UTRICULARIA VULGARIS L. In Lehigh river at Island Park. Aug. 25, 1902.
UTRICULARIA INTERMEDIA Hayne. In shallow water. (Porter.)

OROBANCHACEAE

THALESIA UNIFLORA (L.) Britton. In thickets along Lehigh river 1½ mile east of Bethlehem. June 3, 1899.
OROBANCHE MINOR J. E. Smith. Parasitic on roots of clover. (Porter.)
LEPTAMNIUM VIRGINIANUM (L.) Raf. In beech woods. (Porter.)

BIGNONIACEAE

CATALPA CATALPA (L.) Karst. In wood land along Lehigh river between Bethlehem and Freemansburg. June 25, 1898.

ACANTHACEAE

RUELLIA STREPENS L. In dry woods. (Porter.)

PHRYMACEAE

PHRYMA LEPTOSTACHYA L. In woods on Lehigh Mt. near Lehigh University. Altitude 800 feet. July 1, 1899.

PLANTAGINACEAE

PLANTAGO MAJOR L. In waste places, fields and lawns. Common.
PLANTAGO RUGELII Dec. In fields, woods and waste places. (Porter.)
PLANTAGO LANCEOLATA L. In fields and waste places, Bethlehem.
PLANTAGO ARISTATA Michx. Adventive as a weed on campus of Lafayette College. (Porter.)
PLANTAGO VIRGINICA L. In dry fields on Lehigh Mt. Altitude 850 feet. May 8, 1897.

RUBIACEAE

HOUSTONIA COERULEA L. In grassy fields near Bethlehem; also at Nazareth. Apr. 30, 1896.
HOUSTONIA LONGIFOLIA Gaertn. In dry open places. (Porter.)
CEPHALANTHUS OCCIDENTALIS L. In moist soil on Calypso Island. Aug. 7, 1900.
MITCHELLA REPENS L. In woods at Nazareth. June 15.
DIODIA TERES Walt. In dry or sandy soil. (Porter.)
GALIUM MOLLUGO L. In fields and waste places. (Porter.)
GALIUM APARINE L. In various situations; frequent at Bethlehem. (J. A. Ruth.)
GALIUM PILOSUM Ait. In dry or sandy soil. (Porter.)
GALIUM LANCEOLATUM Torr. North of Bethlehem, June 16, 1905; on Lehigh Mt. near Lehigh University, 1891. (G. W. Caffrey.)
GALIUM CIRCAEZANS Michx. North of Bethlehem, June 16, 1905. (G. W. Caffrey.)
GALIUM BOREALE L. In rocky soil or along streams. (Porter.)
GALIUM TRIFLORUM Michx. North of Bethlehem, June 16, 1905. (G. W. Caffrey.)
GALIUM CLAYTONII Michx. In meadows along Saucon creek two miles from its mouth. Sept. 4, 1900.
GALIUM ASPRELLUM Michx. In meadows along Saucon creek. Sept. 4, 1900.
SHERARDIA ARVENSIS L. On ore dumps on Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.

CAPRIFOLIACEAE

SAMBUCUS CANADENSIS L. In fields and along Lehigh river; in Monocacy valley.
SAMBUCUS PUBENS Michx. In rocky woods near Wind Gap.
VIBURNUM ACERIFOLIUM L. In dry woods. (Porter.)
VIBURNUM PUBESCENS (Ait.) Pursh. In rocky woods. (Porter.)
VIBURNUM DENTATUM L. In moist soil. (Porter.)
VIBURNUM LENTAGO L. In rich soil along Saucon creek.
VIBURNUM PRUNIFOLIUM L. In thickets along Monocacy creek. June, 1897.
TRIOSTEUM PERFOLIATUM L. In rich soil. (Porter.)
SYMPHORICARPOS RACEMOSUS Michx. In rocky places and on river shores. (Porter.)
SYMPHORICARPOS SYMPHORICARPOS (L.) MacM. Along rivers and in rocky places, escaped. (Porter.)
LONICERA DIOICA L. In rocky and usually dry situations. (Porter.)
LONICERA SEMPERVIRENS L. In low ground or on hillsides. (Porter.)
LONICERA JAPONICA Thunb. Escaped from cultivation. (Porter.)
LONICERA TATARICA L. Escaped from cultivation. (Porter.)
DIERVILLA DIERVILLA (L.) MacM. In rocky situations on Lehigh Mt., June 16, 1905. (G. W. Caffrey.)

VALERIANACEAE

VALERIANELLA LOCUSTA (L.) Bettke. In meadows along Saucon creek. June 1, 1900.
VALERIANELLA RADIATA (L.) Dufr. In wet meadows along Monocacy near Bethlehem, May 13, 1897; also along Saucon creek.

DIPSACACEAE

DIPSACUS SYLVESTRIS Huds. In waste places. (Porter.)

CUCURBITACEAE

MICRAMPELIS LOBATA (Michx.) Greene. In thickets and waste places. Bethlehem. Aug. 20, 1898.
SICYOS ANGULATUS L. In moist places, Bethlehem. Aug. 12, 1899.

CAMPANULACEAE

CAMPANULA ROTUNDIFOLIA L. On moist rocks and in meadows. (Porter.)
CAMPANULA APARINOIDES Pursh. In wet meadows along Monocacy creek. Aug. 12, 1899.
LEGOUZIA PERFOLIATA (L.) Britton. In dry soil near Freemansburg.
LOBELIA CARDINALIS L. In moist soil near Nazareth.
LOBELIA SYPHILITICA L. In Saucon and Monocacy valleys, Oct. 3, 1896; also in moist soil at Island Park, Aug. 25.
LOBELIA SPICATA Lam. In fields between Bethlehem and Easton (J. A. Ruth); in dry rocky soil on Lehigh Mt., July 1, 1899.
LOBELIA INFLATA L. In dry fields, Bethlehem. Oct. 20, 1897.

CICHORIACEAE

CICHORIUM INTYBUS L. Along roadsides on outskirts of Bethlehem, it having been cultivated by the early Moravians; also at Island Park. Aug. 25, 1902.
CICHORIUM INTYBUS DIVARICATUM DC. Associated with the preceding.
LAPSANA COMMUNIS L. Along roadsides and in waste places, Easton. (Porter.)
ADOPOGON VIRGINICUM (L.) Kuntze. In woods on Lehigh Mt. near South Bethlehem. May 30, 1900.
ADOPOGON CAROLINIANUM (Walt.) Britton. In dry sandy soil.
LEONTODON AUTUMNALE L. In fields at Seidersville. (Bull. Torrey Club, **16**: 24. 1889.
LEONTODON NUDICAULE (L.) Porter. In waste places, Seidersville. (Britton & Brown Ill. Flora 3, **3**: 266.)
PICRIS HIERACIOIDES L. In waste places. Seidersville. Bull. (Torrey Club, **16**: 24. 1889.)
TRAGOPOGON PORRIFOLIUS L. In fields and waste places, Bethlehem.
TARAXACUM TARAXACUM (L.) Karst. Common everywhere.
TARAXACUM ERYTHROSPERMUM Andrz. In fields and roadsides, Bethlehem. May 4, 1902.
SONCHUS ARVENSIS L. In low grounds, fields and roadsides. (Porter.)
SONCHUS ASPER (L.) All. In fields and waste places. (Porter.)
LACTUCA SCARIOLA L. In fields and waste places, Bethlehem. Aug. 12, 1899. Some years ago it was very abundant in the Lehigh Valley in this and Lehigh county but for the last several years it has not been as plentiful.
LACTUCA CANADENSIS L. In moist open places. (Porter.)
LACTUCA SAGITTIFOLIA Ell. In dry open soil. (Porter.)
LACTUCA VILLOSA Jacq. In thickets. (Porter.)
LACTUCA FLORIDANA (L.) Gaertn. In moist open places. (Porter.)
LACTUCA SPICATA (Lam.) Hitchc. Along roadsides, Bethlehem. Aug. 12, 1899.
CREPIS VIRENS L. In fields and waste places, Easton. (Porter.)
CREPIS BIENNIS L. In waste places, Easton. (Porter.)
HIERACIUM PILOSELLA L. In door yards and fields, Easton. (Porter.)
HIERACIUM VENOSUM L. In woods on Lehigh Mt.
HIERACIUM MARIANUM Willd. In dry woods and thickets. (Porter.)
HIERACIUM SCABRUM Michx. In dry woods and clearings. (Porter.)
HIERACIUM GRONOVII L. In dry soil. (Porter.)
NABALUS ALTISSIMUS (L.) Hook. In woods and thickets. (Porter.)
NABALUS ALBUS (L.) Hook. In woods. (Porter.)
NABALUS SERPENTARIUS (Pursh.) Hook. In fields and thickets. (Porter.)
NABALUS TRIFOLIATUS Cass. In woods and thickets on Lehigh Mt.

AMBROSIACEAE

AMBROSIA TRIFIDA L. In moist soil, Bethlehem. Aug. 5, 1899. Also at Portland.
AMBROSIA TRIFIDA INTEGRIFOLIA (Muhl.) T. & G. In moist soil, Bethlehem.

AMBROSIA ARTEMISIAEFOLIA L. In dry fields and waste places, Bethlehem. Aug. 30, 1898.

XANTHIUM SPINOSUM L. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.

XANTHIUM GLABRATUM (D.C.) Britton. In waste places, Bethlehem. Oct. 1896.

XANTHIUM PENNSYLVANICUM Wallr. In open places. (Porter.)

XANTHIUM ECHINATUM Murr. On river shores. (Porter.)

COMPOSITAE

VERNONIA GLAUCA (L.) Britton. In thickets near Bethlehem. Sept. 7, 1899.

EUPATORIUM MACULATUM L. In moist soil. (Porter.)

EUPATORIUM MACULATUM AMOENUM (Pursh) Britton. In dryer places. (Porter.)

EUPATORIUM PURPUREUM L. In moist soil. (Porter.)

EUPATORIUM TRIFOLIATUM L. In moist soil, Easton. (Porter.)

EUPATORIUM SESSILIFOLIUM L. In dry woods. (Porter.)

EUPATORIUM VERBENAEFOLIUM Michx. In moist soil. (Porter.)

EUPATORIUM PERFOLIATUM L. In wet places along Monocacy creek.

EUPATORIUM AGERATOIDES L. f. In woods on Lehigh Mt. Sept. 22, 1898.

EUPATORIUM AROMATICUM L. In rocky soil on Lehigh Mt. Sept. 22, 1898.

MIKANIA SCANDENS (L.) Kuntze. In swamps and moist soil. (Porter.)

KUHNIA EUPATORIOIDES L. In dry soil. (Porter.)

LACINARIA SPICATA (L.) Kuntze. In moist soil. (Porter.)

SOLIDAGO SQUARROSA Muhl. In rocky soil. (Porter.)

SOLIDAGO CAESIA L. In woods and thickets on Lehigh Mt. Sept. 22, 1898.

SOLIDAGO FLEXICAULIS L. In rich woods. (Porter.)

SOLIDAGO BICOLOR L. In dry shaded soil, Lehigh Mt. Sept. 22, 1898.

SOLIDAGO SPECIOSA Nutt. On limestone rocks on both sides of Delaware river at Easton. (Porter.)

SOLIDAGO ODORA Ait. In dry soil. (Porter.)

SOLIDAGO RUGOSA Mill. In dry soil, Lehigh Mt. Sept. 22, 1898.

SOLIDAGO PATULA Muhl. In swamps. (Porter.)

SOLIDAGO ULMIFOLIA Muhl. In woods and copses. (Porter.)

SOLIDAGO JUNCEA Ait. In dry and rocky soil. (Porter.)

SOLIDAGO ARGUTA Ait. In woods, Lehigh Mt. Sept. 22, 1898.

SOLIDAGO SEROTINA Ait. In moist soil. (Porter).

SOLIDAGO SEROTINA GIGANTEA (Ait.) Gray. With the type. (Porter.)

SOLIDAGO CANADENSIS L. Usually in dry soil. (Porter.)

SOLIDAGO CANADENSIS SCABRIUSCULA (Porter.) (Porter.)

SOLIDAGO NEMORALIS Ait. In dry soil. Bethlehem.

SOLIDAGO RIGIDA L. On limestone rocks on both sides of Delaware river at Easton. (Porter.)

EUTHAMIA GRAMINIFOLIA (L.) Nutt. In fields, Bethlehem. Aug. 20, 1898. This plant is frequently infested with the black blister beetle.

BELLIS PERENNIS L. In waste places. (Porter.)

SERICOCARPUS ASTEROIDES (L.) B.S.P. In dry woods. (Porter.)

ASTER DIVARICATUS L. In shaded situations, Bethlehem. Oct. 1896.

ASTER DIVARICATUS CYMULOSUS Burgess. In woods. (Porter.)

ASTER CLAYTONIA Burgess. In sunny or slightly shaded rocky places. (Porter.)

ASTER CURVESCENS Burgess. In loose moist shaded soil. (Porter.)

ASTER SCHREBERI Nees. In borders of woods and shaded fence rows. (Porter.)

ASTER MACROPHYLLUS L. In moderately dry soil and in shaded places. (Porter.)

ASTER ROSCIDUS Burgess. In slight shade and in rich cleared soil or woodlands. (Porter.)

ASTER CORDIFOLIUS L. In woods and in dry soil, Bethlehem.

ASTER CORDIFOLIUS POLYCEPHALUS Porter. At Easton, Oct. 1888. (Porter.)

Aster cordifolius Lowrieanus. (Porter.) In woods near Bethlehem and along Lehigh canal.
Aster cordifolius lancifolius (Porter.) In woods. (Porter.)
Aster cordifolius Bicknellii Porter. In woods. (Porter.)
Aster sagittifolius Willd. In dry soil. (Porter.)
Aster undulatus L. In dry soil, Bethlehem. (J. A. Ruth.)
Aster patens Ait. In dry soil, Bethlehem. Oct., 1897.
Aster phlogifolius Muhl. In open woods between Bethlehem and Easton. July 12, 1905. (J. A. Ruth.)
Aster Novae-Angliae L. In fields and along swamps. (Porter.)
Aster amethystinus Nutt. In moist soil along Delaware river. (Porter.)
Aster puniceus L. In swamps. (Porter.)
Aster patulus Lam. Bethlehem. (Porter.)
Aster prenanthoides Muhl. In moist soil. (Porter.)
Aster prenanthoides porrectifolius Porter. (Porter.)
Aster laevis L. Usually in dry soil. (Porter.)
Aster laevis amplifolius Porter. (Porter.)
Aster Radula Ait. In swamps. (Porter.)
Aster acuminatus Michx. In moist woods. (Porter.)
Aster dumosus L. In sandy soil, Bethlehem. (Porter.)
Aster salicifolius Lam. In moist soil. (Porter.)
Aster salicifolius subasper (Lindl.) A. Gray. (Porter.)
Aster paniculatus Lam. Along fences and fields. (Porter.)
Aster paniculatus acutidens Burgess. (Porter.)
Aster Tradescanti L. In fields and swamps. (Porter.)
Aster ericoides L. In fields along Monocacy creek.
Aster lateriflorus (L.) Britton. In dry soil near Bethlehem. Oct. 1896.
Aster lateriflorus glomerellus (T. & G.) Burgess. (Porter.)
Aster lateriflorus thyrsoideus (A. Gray) Sheldon. (Porter.)
Aster lateriflorus grandis Porter. (Porter.)
Aster lateriflorus horizontalis (Desf.) Burgess. (Porter.)
Aster vimineus Lam. In moist soil. (Porter.)
Aster vimineus Columbianus Britton. (Porter.)
Aster multiflorus Ait. In dry open places. Abundant on both sides of Delaware river at Easton. (Porter.)
Erigeron pulchellus Michx. On hillsides along Monocacy valley two miles north of Bethlehem. May 12, 1897.
Erigeron philadelphicus L. In fields and woods. (Porter.)
Erigeron annuus (L.) Pers. In fields, common. Bethlehem. July 10, 1899. At Portland, July 4, 1912.
Erigeron ramosus (Walt.) B.S.P. In fields. (Porter.)
Erigeron acris L. On ore dumps on Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.
Leptilon canadense (L.) Britton. In dry fields, Bethlehem. Aug. 12, 1899.
Doellingeria umbellata (Mill.) Nees. In moist soil. (Porter.)
Doellingeria infirma (Michx.) Greene. In dry, usually rocky soil. (Porter.)
Ionactis linariifolius (L.) Greene. In dry or rocky soil. (Porter.)
Antennaria neodioica Greene. In dry shady places. (Porter.)
Antennaria neglecta Greene. In fields and pastures. (Porter.)
Antennaria plantaginifolia (L.) Richards. In woods, Lehigh Mt. April 28, 1897.
Anaphalis margaritacea (L.) Benth. & Hook. In dry soil between Bethlehem and Nazareth and on Lehigh Mt. near Lehigh University, altitude 850 feet.
Gnaphalium obtusifolium L. In dry soil, Bethlehem.
Gnaphalium uliginosum L. In damp soil. (Porter.)
Gnaphalium purpureum L. In dry sandy soil. (Porter.)
Inula Helenium L. On roadsides and in fields. (Porter.)
Inula viscosa Desf. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.
Polymnia Uvedalia L. In rich woods near Easton. (Porter.)

HELIOPSIS HELIANTHOIDES (L.) B.S.P. In open places. (Porter.)
HELIOPSIS SCABRA Dunal. Usually in dry soil. (Porter.)
RUDBECKIA HIRTA L. In fields along Lehigh canal east of Bethlehem; on Lehigh Mt. ascending 850 feet; June 17, 1896.
RUDBECKIA LACINIATA L. In meadows along Monocacy creek. Aug. 12, 1899.
HELIANTHUS ANNUUS L. In waste grounds; escaped. Bethlehem.
HELIANTHUS PETIOLARIS Nutt. In dry soil, Bethlehem. (Porter.)
HELIANTHUS GIGANTEUS L. In swamps and wet meadows. (Porter.)
HELIANTHUS DIVARICATUS L. In woodland, Lehigh Mt. July 23, 1911. Altitude 850 feet.
HELIANTHUS DECAPETALUS L. In moist soil along Lehigh river 1 mile east of Bethlehem. Sept. 4, 1899. At Portland, July 4, 1912.
HELIANTHUS TRACHELIIFOLIUS Mill. In dry soil. (Porter.)
HELIANTHUS STRUMOSUS L. In dry woods and on banks. (Porter.)
HELIANTHUS STRUMOSUS MACROPHYLLUS (Willd.) Britton. (Porter.)
HELIANTHUS HIRSUTUS Raf. In dry soil. (Porter.)
HELIANTHUS TUBEROSUS L. In fields and along roadsides, Bethlehem. Sept. 7, 1899.
VERBESINA ALTERNIFOLIA (L.) Britton. In rich soil. (Porter.)
COREOPSIS TINCTORIA Nutt. In moist soil. (Porter.)
COREOPSIS VERTICILLATA L. Escaped. (Porter.)
BIDENS LAEVIS (L.) B. S. P. In swamps along Monocacy creek. Sept. 28, 1896.
BIDENS CERNUA L. In swamps along Monocacy creek near Bethlehem. Sept. 28, 1896. (J. A. Ruth.)
BIDENS CONNATA Muhl. In swamps and moist soil. (Porter.)
BIDENS COMOSA (A. Gray) Wiegand. In wet soil. (Porter.)
BIDENS DISCOIDEA (T. & G.) Britton. On the Delaware river above Easton. (Porter.) In moist soil along Lehigh canal between Bethlehem and Freemansburg. Sept. 4, 1899.
BIDENS FRONDOSA L. In waste grounds, Bethlehem. Sept. 4, 1899.
BIDENS VULGATA Greene. In moist soil. (Porter.)
BIDENS BIPINNATA L. In moist soil along Lehigh canal east of Bethlehem. Sept. 4, 1899.
GALINSOGA PARVIFLORA Cav. Along roadsides, Bethlehem. Oct. 20, 1897.
GALINSOGA PARVIFLORA HISPIDA DC. In waste places and along roadsides, Bethlehem.
HELENIUM AUTUMNALE L. In meadows and moist places along Monocacy creek, Sept. 5; at Island Park, Aug. 25; also in Saucon valley. Flowers generally infested by a small cuculio.
ACHILLEA MILLEFOLIUM L. In waste places, roadsides and fields, Bethlehem. Sept. 28, 1896. At Portland, July 4, 1912.
ANTHEMIS COTULA L. In waste places, Bethlehem. July 10, 1899.
ANTHEMIS ARVENSIS L. In fields and waste places. (Porter.)
CHRYSANTHEMUM LEUCANTHEMUM L. In meadows and hillsides in Saucon and Monocacy valleys and in Lehigh valley. Ascends Lehigh Mt. 850 feet. June 12, 1896. At Portland, July 4, 1912.
CHRYSANTHEMUM PARTHENIUM (L.) Pers. In waste places, escaped. (Porter.)
CHRYSANTHEMUM PROCUMBENS Rich. On ore dumps in Bethlehem Steel Co.'s yards. Reported in Bull. Torrey Club **19**: 10. 1892.
TANACETUM VULGARE L. Along roadsides. Escaped. (Porter.)
ARTEMISIA ANNUUA L. In waste places. (Porter.)
ARTEMISIA VULGARIS L. In waste places, Bethlehem. (Porter.)
TUSSILAGO FARFARA L. In damp, shaded soil, Bethlehem. April 27, 1897.
PETASITES PETASITES (L.) Karst. In waste grounds, Bangor. (Porter.)
ERECHTITES HIERACIFOLIA (L.) Raf. In woodlands, thickets and waste places. (Porter.) In woods near South Bethlehem. (J. A. Ruth.)
MESADENIA RENIFORMIS (Muhl.) Raf. In woods. (Porter.)
MESADENIA ATRIPLICIFOLIA (L.) Raf. In woods. (Porter.)

SENECIO OBOVATUS Muhl. In moist soil and on banks. (Porter.)

SENECIO OBOVATUS ELONGATUS (Pursh.) Britton. On moist shaded banks, Easton. (Porter.)

SENECIO BALSAMITAE Muhl. In dry and rocky soil. (Porter.)

SENECIO AUREUS GRACILIS (Pursh.) Britton. In meadows along Saucon creek two miles from its mouth May 12, 1896.

ARCTIUM MINUS Schk. In waste places, Bethlehem and Portland.

CARDUUS LANCEOLATUS L. In waste places, Bethlehem.

CARDUUS DISCOLOR (Muhl.) Nutt. In dry soil along roadsides and in fields between Bethlehem and Freemansburg. Sept. 4, 1899.

CARDUUS MUTICUS (Michx.) Pers. In swamps and moist soil. (Porter.)

CARDUUS ARVENSIS (L.) Robs. Along roadsides and fields, Bethlehem.

CENTAUREA CYANUS L. In waste places along Monocacy creek one-half mile north of Bethlehem. June 20, 1901.

SUMMARY

The following fifteen families are represented by twenty or more species in each family or an aggregate of 732 species. This is more than half the flora of the county, although it covers less than twelve per centum of the families. It will be noted that the Compositae and Graminae are the leading families.

	Number of Species
Naiadaceae	21
Gramineae	111
Cyperaceae	87
Polygonaceae	25
Caryophyllaceae	28
Ranunculaceae	27
Cruciferae	42
Rosaceae	35
Papilionaceae	50
Violaceae	20
Umbelliferae	28
Labiatae	49
Scrophulariaceae	33
Cichoriaceae	31
Compositae	145

The flora of the county is made up as follows:

Number of families represented	128
Number of genera represented	523
Number of introduced species	307
Total number of species	1.304

REVIEWS

Stone's Flora of Southern New Jersey*

Most botanists who see the work here described will doubtless be surprised to find that one of the best local floras ever published has been written by a man who is primarily an ornithologist, and issued by an institution which has not previously figured as a producer of botanical literature. As the book lacks a table of contents, a synopsis is subjoined which will probably give the reader a clearer idea of its scope than would the same number of words arranged in sentences.

Preface, 25–37.
  Herbaria consulted, 26–29. Field work, 30–33.
  Nomenclature, classification, synonymy, 34–36.
Introduction, 39–112.
  Life-zones and floral belts of Eastern North America, 39–41.
  Relations between coastal plain and Piedmont vegetation, 42–47.
  General distribution of New Jersey coastal plain plants, 47–56.
    Plants of wide range, 48, Northern element, 48–50, Southern element, 50–56, Local element, 56.
  Botanical divisions of the coastal plain in New Jersey, 57–99.
    Pine-barrens, 61–80.
      History of exploration, 62–68.
      Forests, 68–69.
      Habitat lists, 69–70.
        Typical pine forests, 69, Bare sand, 70, Cedar swamps, 70, Open bogs, 70, "Plains," 70–72.
      Previous definitions of New Jersey pine-barrens, 72–75.
      Statistics of pine-barren flora, 75–76.
      Lists of plants, 76–80.
        Characteristic of pine-barrens, 76–78.
        Common to pine-barrens and Middle district, 78–80.
    Middle district, 80–88.
      Habitat lists, 84, Statistics, 85–86.
      Characteristic plants, 86–88.
    Coast strip, 88–92.
      Boreal species, 89, Island vegetation, 89–90.
      Characteristic species of coast strip, 91.
      Species common to coast strip and Middle district and absent from pine-barrens, 91.
    Cape May district, 92–96.

* The plants of southern New Jersey, with especial reference to the flora of the pine barrens and the geographic distribution of the species. By Witmer Stone. Curator, Academy of Natural Sciences, Philadelphia. Ann. Rep. N. J. State Mus. **1910**: 21–828. *pl. 1–129.* Map. 1911. Ja 1912.

Perhaps the most noteworthy feature of the work, next to the profusion of original observations, is the emphasis laid throughout on natural geographical divisions based on soil and vegetation. The author here discards, though apparently not without some reluctance, the parallel transcontinental "life-zones" of his fellow zoölogists, and will perhaps be regarded by some of them as a heretic for daring to mention such a sharply defined and non-climatic geographical province as the coastal plain (whose significance was scarcely recognized by botanists up to about fifteen years ago, or by Stone himself until much more recently). As a partial justification of this seeming heresy he explains (pp. 42, 43) that perhaps the fall-line (the inland boundary of the coastal plain) has more effect on plants than it has on animals. (See also page 102.)

On page 42 the author expresses the opinion that because in the southern states "a great many coastal plain plants range far west of the fall-line," that line "is less potent southward." This conclusion is not well founded, though, for in Georgia for example there are scores if not hundreds of species of plants confined to the coastal plain which do not reach New Jersey at all; and the change in vegetation at the fall-line is just as noticeable in the Carolinas and Georgia as it is in New Jersey, and perhaps more so than in Maryland and Virginia.

The area covered by the catalogue of plants is not quite coextensive with the coastal plain of New Jersey, but terminates at a county boundary about ten miles southeast of the fall-line (p. 40); an expedient justified by the fact that herbarium specimens collected in the counties through which the fall-line passes are in many cases not labeled with sufficient accuracy to indicate on which side of that important line they grew,* and the narrow strip of coastal plain thus excluded is probably too small to contain any characteristic species that are not represented in the rest of the area.

By directing attention primarily to the vegetation the author has divided his territory into five pretty well marked regions, instead of the two divisions of the geologists, or only one as the zoölogists would have it. The colored map at the beginning of the volume shows the boundaries of the pine-barrens and the salt marshes very clearly, but combines the other divisions of the coastal plain in one color (and errs in including the whole of Staten Island in the coastal plain).

The summary of the field work of the author and his associates, in the preface, is accompanied by a small map showing their routes of exploration, which illustrates a commendable tendency to study plants *along routes*, instead of *at localities* in the old-fashioned or traditional manner of systematists.

The statistical lists of plants in various parts of the introduction are of a type familiar in some of the more pretentious local floras, and as they are not summarized the longer ones make rather dry reading. In other words, the opportunity to make some interesting generalizations about the times of flowering, modes of dissemination, percentage of monocotyledons, families and genera most numerously represented or conspicuous by their absence, etc., in each list was not taken advantage of. But that is so rarely done, and there are so many other things of interest and value in the book, that it would be unfair to criticize such omissions, and this remark is inserted merely as a suggestion for the future.

* In this connection see Bull. Torrey Club **31**: 10. 1904.

No attempt is made to describe the vegetation of the whole area systematically (for sufficient reasons, which the author explains on pages 33, 70 and 71); but under three of the geographical divisions, namely, the pine-barrens, the middle district, and the strand, quite a number of the characteristic or more abundant or conspicuous species are classified by habitat; which perhaps had never been done before for the middle district and pine-barrens. The relative abundance of the plants in these lists is not indicated, and some of them are not arranged in any apparent order; but habitat lists are still somewhat of a novelty (probably 90 per cent. of these published in America up to the present time are less than 15 years old), and there are very few local floras as yet which treat them any more scientifically than this one does.

Nearly as much space is devoted to the pine-barrens as to the other four regions combined, for that is the most unique and at the same time the least disturbed by civilization. The author here points out (pp. 57–58, 72–75) how the boundaries of this region have been misinterpreted by previous writers. Some have treated the whole coastal plain as pine-barrens, while others—mainly geologists— have regarded the region in question as coinciding with the area underlaid by Tertiary formations. A few had already noticed that the southern and western portions of the Tertiary region of New Jersey are not to be classed as pine-barrens, but it seems to have remained for Professor Stone himself to make known (about five years ago*) the fact that between the pine-barrens and the coast, and extending some distance into the pine-barrens along the larger streams, is a strip of vegetation very similar to that of the middle district. This narrow belt of quasi-climax vegetation is not explained, but it probably owes its existence very largely to the protection from fire on one or both sides afforded by the waterways.†

On pages 73, 215, 402, 454, 485, and 802 one finds an idea that seems to be entirely new, namely, that on the larger streams the

* Proc. Phila. Acad. **59**: 452–459. 1907.

† See Bull. Torrey Club **38**: 515–525. 1911.

dams nearest the coast now seem to mark the dividing line between the pine-barren vegetation and that of the coast strip, especially in the case of water-loving plants. This accords very well with the belief recently expressed by the reviewer* that *pioneer* aquatic vegetation is commonly associated with *minimum* seasonal fluctuations of water, and *vice versa;* for seasonal fluctuations are of course least just above a dam or shoal or waterfall and greatest just below, and these dams have probably been in existence long enough for the vegetation to adjust itself pretty well to such conditions.

The vegetation of the pine-barrens, both upland and lowland, is distinctly of a pioneer type, with *Pinus rigida* the dominant tree. Among the less obvious floristic characters which distinguish it from that of the neighboring regions are abundance of monocotyledons, *Chamaecyparis, Rhynchospora, Gyrotheca, Lophiola, Utricularia* (p. 689), Melanthaceae, Orchidaceae (361) and Ericaceae (617), and scarcity or absence of *Equisetum, Pinus Virginiana, Juniperus, Carex* (285), *Hicoria* (398), *Fagus* (403), *Salix, Polygonum sagittatum* (426), *Ranunculus* (455), *Platanus* (475), *Crataegus, Impatiens* (545), *Viola, Liquidambar* (474), *Diospyros* (634), *Quercus Phellos* (474), *Prunus serotina* (492), *Cornus florida* (602), Liliaceae, native Cruciferae (462), Umbelliferae, Labiatae, Scrophulariaceae, spring flowers (453) and weeds. (Almost the same might be said of some of the pine-barrens of the southeastern states.) In the list of characteristic pine-barren plants on pages 77–78, 47 per cent. of the angiosperms are monocotyledons, and there are 11 species of Ericaceae and Vacciniaceae. Nine of the 13 Melanthaceae mentioned in the catalogue grow in the pine-barrens, and three of them are confined to that region and one nearly so.

On pages 81, 100 and 101 the author points out that the Middle district is not a mere "tension zone" between the pine-barrens and the Piedmont region, as was recently supposed, but has enough characters of its own to rank equally with the pine-barrens as a distinct geographical division. It includes all of

* Ann. Rep. Fla. Geol. Surv. **3**: 234, 237; Bull. Torrey Club **38**: 231–232; Torreya **11**: 233–234. 1911.

the Cretaceous and part of the Tertiary region of New Jersey, and is the northern analogue of the "Middle district" of South Carolina, as defined by geographers a century ago. Its soil being much richer than that of the pine-barrens, the area is now mostly under cultivation and pretty thickly settled, and natural vegetation is scarce (p. 82). The remaining forests are mostly deciduous, contrasting strongly with the evergreen pine-barrens. (See interesting notes on this point on pages 474 and 602.) Several isolated colonies of pine-barren (mostly bog) plants are known in this region (see p. 74, and several places in catalogue), and they are regarded, no doubt correctly, as relicts rather than as recent invasions, which is presumably true also of the numerous colonies of pioneer plants outside of the coastal plain in the states farther south. Only 22.4 per cent. of the angiosperms listed as characteristic of the middle district on pages 88–90 are monocotyledons; which is less than half the percentage for the typical pine-barren plants.

The short chapter on weeds (pp. 99–101) is very interesting. The author states there that such plants are comparatively rare and easily recognized in the pine-barren region, where they are chiefly confined to the vicinity of the older and larger settlements, where the native vegetation has been damaged or destroyed by civilization. Spontaneous encroachment of introduced plants upon ground occupied by natives is practically unknown. Several "native" species which behave like weeds in the pine-barrens are listed on page 100, but there seems to be absolutely no evidence that they are native in New Jersey or anywhere near there.

In the taxonomic catalogue, which makes up the greater part of the book, about 1,400 species of vascular plants are enumerated, and nearly half a page is given to each. It is not a regular descriptive flora, but keys to all the species are included (at the request of the Museum authorities, the author says on page 34), and these keys are not merely copied from other books, but show considerable originality. This work differs from nearly all other local floras of similar scope in excluding known introduced species from the catalogue proper—though many of them are mentioned in the keys, for purposes of identification. This way of treating them corresponds with current ornithological usage, and is a decided improvement on the practice of most botanists. Since the author has gone ahead of his botanical predecessors to the extent of excluding species known to have been introduced from foreign countries, one can hardly criticize him for not going a step farther and excluding species which are commonly supposed —though sometimes on insufficient grounds—to be native in other parts of the northeastern United States, when there is no good evidence of their indigeneity in southern New Jersey. (Several examples are mentioned on page 100, and numerous others in the catalogue.*) He does indeed state in many such cases that the species in question can hardly be native in the pine-barrens, and implies that they might be equally foreign to the other parts of his territory.

The author's ornithological training is revealed in his methods of citation. Wherever a species has been transferred from one genus to another the author of the new binomial is ignored, a practice more justifiable under the "Rochester" rules of two decades ago, which gave absolute priority to specific and varietal names, than under the rules of botanical nomenclature now in vogue, which allow some classes of exceptions. Like most zoologists and some botanists, he decapitalizes all specific names, regardless of origin, and uses Roman numerals for volume numbers. (In citing periodicals in footnotes the year is often substituted for the volume number, as was the custom for a number of years with the proceedings of the institution of which he is curator.) Each species listed is accompanied by a citation of its original description and type-locality (these data not merely copied from another book, but verified from the originals in nearly every case; see p. 34), and references to the pages of a few previous floras of the same region where it is mentioned. If it has been listed under different names in any of these other works those names are also given. Every accepted species is also given an English name (a fictitious one if no *bona-fide* one is known), in which particular the author is again following ornithological usage.

* See also Bull. Torrey Club **35**: 352–353. 1908.

The best feature of the catalogue is the way in which the distribution of each and every native species is summed up with reference to the whole state, and correlated with habitats as far as possible. The author here shows a wholesome disregard for the fetters of tradition, and although full credit is given to previous writers (see p. 26), many questionable statements about the occurrence of certain species in southern New Jersey (*e. g.*, *Lophotocarpus*, *Dichromena*, *Aletris aurea*, *Chondrophora*) that have been handed down for generations and accepted without much question are rejected for lack of evidence, and many alleged distinct species proposed in recent years are relegated to synonymy, though not without some explanation. In the case of several of the rarer or otherwise noteworthy species there are interesting annotations, sometimes extending over more than a page (about three pages for *Schizaea* and six for *Corema*),* and often accompanied by references to biographical sketches of the persons who first found them in the state. The time of flowering is given in most cases, and finally the known localities in the region, always classified according to the five natural divisions.

On the whole, this catalogue gives all the information about the local distribution of the species that one could reasonably expect, and in that respect it is far ahead of most of the floras of states and smaller areas that have been published in recent years. It serves very nearly the same purpose for 1,400 northeastern plants that Mohr's Plant Life of Alabama does for 2,500 southeastern plants, and measures well up to the high standard for local floras suggested in a valuable unsigned editorial in the Botanical Gazette for May, 1896. The information about habitats is more satisfactory on the whole than that found in our manuals, which treat such matters altogether too lightly.

The whole treatise gives one the impression of being based on very thorough work, and leaving very little for future explorers

* On page 634 the author notes a very interesting geographical triple correlation between the persimmon, the opossum and the negro (not the city-dwelling but the rural or agricultural negro, whose northern range is more restricted). One can hear rumors of such a correlation in some of the southern states, and the reviewer was told as long ago as 1905 by Dr. Hollick while on a trip to the southern part of Staten Island that it holds even there; but it perhaps has never been so definitely expressed in print before.

of that region to do in the way of defining local distribution. Although the author has shown a most commendable conservatism in refusing to include species whose occurrence or taxonomic status is doubtful, he does not seem to have overlooked any important source of information, or to have rejected any recently described species without reasons that seemed sufficient to him. Persons who contemplate doing floristic work on a similar scale elsewhere in the near future would do well to take Mr. Stone's work for a model, and not allow themselves to fall short of his ideals.

From the little statistical summary on page 806 one can easily gather an interesting fact that is not mentioned anywhere in the book; namely, 36.6 per cent. of the angiosperms catalogued are monocotyledons. This is the largest proportion of monocotyledons in any equal area of dry land in North America, as far as known to the reviewer,* and indicates again the decided pioneer character of the vegetation of a large part of the area.

The bibliography contains 92 titles, with extended comments on some of the papers, and references to biographical sketches of some of the earlier authors. It is arranged chronologically or nearly so, and is probably nearly complete for the ground covered.

The index unfortunately is not up to the standard of the rest of the book, as it is almost confined to the accepted species in the taxonomic catalogue. Both technical and common names are included, but there is only one reference to each, synonyms seem to be ignored, and the species are not indexed separately except in a few of the larger genera. The names of botanists whose biographies are referred to in the same 666 pages, and some of the chapter headings in the first 100 pages, are also included. The bulk of the index would have been increased very little by including references to all the explorers of the region, especially those whose biographies are referred to in the bibliography; and perhaps not at all by including the plants mentioned in the introductory part. This, however, may be one of those too common cases where the index was prepared by some other person than the author.

* See Torreya 5: 207–210. 1905.

Last but not least are the 129 half-tone plates, representing over 350 species of plants. The book contains no list of these illustrations, but they may be classified approximately as follows: Photographs of vegetation, 3 per cent. (one of them is out of plumb, a very common but well-nigh inexcusable fault of half-tone cuts*); photographs of single plants in their native haunts (mostly by Bayard Long), 8 per cent.; photographs of whole plants removed from their natural surroundings (mostly by Stewardson Brown), 12 per cent.; photographs of fragments of plants (mostly pressed inflorescences of grasses, sedges and rushes), 34 per cent.; photographs of paintings of single plants by H. E. Stone, 31 per cent.; line-drawings of single plants (also by H. E. Stone), 12 per cent. The last three classes add little to existing knowledge, but they are useful for purposes of identification, like the keys, and they doubtless include some species which had not been figured before (outside of the small line-drawings in Britton & Brown's Illustrated Flora).

The book contains many other valuable features, which can hardly be mentioned in the brief space of a review. With such a splendid floristic foundation to build on, the time is now ripe for some ecologically-inclined botanist to make a detailed study of the vegetation of the same region, and thereby fill a long-felt want and perhaps win laurels for himself. It seems strange that more work like this of Stone's has not been done, especially in those parts of the country where botanists are most numerous and where some of them have ample leisure and resources.

Roland M. Harper

PROCEEDINGS OF THE CLUB

May 29, 1912

The meeting of May 29, 1912, was held in the laboratory of the New York Botanical Garden at 3:30 P.M., Vice-president Barnhart presiding. Twelve persons were present.

The minutes of April 24 and May 14 were read and approved.

* See Science II: **35**: 985. 1912.

Dr. R. A. Harper announced the death of Professor E. Strasburger.

A motion was carried instructing the officers of the club to nominate honorary members at the first fall meeting. On motion of Dr. Britton, Dr. Harper was invited to act with the committee.

Mr. B. O. Dodge referred to the recent death of Mr. Gustav L. Ramsperger, one of the oldest members of the club, and suggested that some action be taken in regard to the matter.

On motion of Mrs. Britton the chairman was requested to appoint a committee, with power, to prepare a suitable memorandum for incorporation in the minutes of the meeting, and the secretary was instructed to transmit a copy of the same to the family of the deceased.

The chairman appointed Dr. Hollick, Dr. Britton, and Dr. Rusby as such committee and they subsequently prepared the following memorandum:

The Torrey Botanical Club records with sincere sorrow the recent death, in the eighty-eighth year of his age, of Gustav Ludwig Ramsperger, who was elected to active membership in the Club on February 9, 1886.

Mr. Ramsperger was born in Germany, December 13, 1824; studied pharmacy as apprentice and assistant, and passed his final examination in 1850. In 1851 he came to America and opened a small drug store in Oliver Street. After a successful business career of sixteen years he acquired an interest in the Faber-Balluff pharmacy, on the corner of 6th Avenue and 38th Street, in which location he was equally successful and in a few years concluded to retire and devote himself to scientific work. He sold out his interest in the pharmacy, but shortly afterwards decided that he was too young to retire from active business and acquired a pharmacy in Brooklyn, at the corner of Fulton and Cumberland Streets, where he remained until he finally retired, on his sixtieth birthday.

Mr. Ramsperger held membership in the New York State Pharmaceutical Association, of which he was a charter member, and in the American Pharmaceutical Association, and was a trustee and honorary vice-president of the New College of Pharmacy. He was also active in many literary, social, charitable and educational societies and institutions, as well as in those of science. He was also a member of the New York Botanical Garden and aided materially in its establishment and development.

To the members of the Torrey Botanical Club he will always be remembered as a genial companion and enthusiastic lover of plants, with whom it was both a pleasure and an inspiration to spend a day in the field.

N. L. Britton
Arthur Hollick
H. H. Rusby

Dr. Britton then brought up a preliminary report on the state of the Underwood Fund, and submitted the following resolution which was adopted:

Resolved: That Miss Caroline Coventry Haynes be and is hereby appointed a Committee to solicit and receive contributions to a fund to become the property of the Torrey Botanical Club and to be a permanent memorial of the late Lucien Marcus Underwood, the interest accumulating on said fund to be used by the Torrey Botanical Club to aid in the illustration of papers published in its *Bulletin*, TORREYA, or *Memoirs*.

The application of Miss Jean Broadhurst for a grant from the Esther Herrman Fund was laid over, pending a more exact statement of the amount of money desired.

The first number on the announced scientific program consisted of a preliminary report on "The Genus *Tabebuia* in the West Indies," by Dr. N. L. Britton.

The paper when completed will be published in the *Bulletin*.

Mr. B. O. Dodge then gave a short account of certain features in the method of reproduction in *Ascobolus*.

Meeting adjourned.

B. O. Dodge,
Secretary

NEWS ITEMS.

For the meaningless last paragraph on the last page of August Torreya the following item should have appeared. The coöperation of botanists is requested in the attempt to enlarge the section of Torreya which is devoted to "News Items." This is the only American magazine devoted solely to botany which has regularly carried a news column. It is now proposed to enlarge this feature of the journal, so that everything of current interest in the botanical world may find permanent record in Torreya. Any changes in teaching staff, additions to equipment or endowment, explorations or botanical expeditions, and any other items of current botanical news will be welcome. The advantages of originally publishing such items in a magazine devoted solely to the science of botany, and also the protection afforded American botanists from prematurely or incorrectly published press dispatches, are features which, it is hoped, will be found sufficiently attractive to ensure hearty coöperation.

Attention is called to the fact that October first is the last day upon which manuscripts of the Local Flora Prize Essay will be received. Full details of this competition were published in Torreya for March.

On Saturday, August 24, Dr. and Mrs. N. L. Britton, accompanied by Mr. Stewardson Brown of the Academy of Natural Sciences at Philadelphia, sailed for Bermuda to continue studies on the flora of that island.

Early in September Dr. C. B. Robinson, who has been working on the family Vacciniaceae at the New York Botanical Garden, will start for the Philippines, to resume work on the flora of the archipelago.

Professor Hugo de Vries is to visit the United States this fall and will give a lecture September 12 for the Brooklyn Botanic Garden at 8.15 P.M. at the Academy of Music, Brooklyn on "Plant breedong in the Botanic Garden of Amsterdam.' On September 14, at 4 P.M. he will lecture at the New York Botanical Garden on "Experiments in Mutation."

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BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

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ON THE ORIGIN AND PRESENT DISTRIBUTION OF THE PINE-BARRENS OF NEW JERSEY*

By Norman Taylor

The peculiarly characteristic features of the pine-barrens of New Jersey have always attracted the interest of botanists and zoölogists. Indeed, the region is so unusual that the ordinary traveler is at once struck with the difference between these sandy plains and pine-tree vegetation, and the richer flora further north. The recent excellent flora[1] of this region by Mr. Witmer Stone has renewed interest in this botanically unique country.

The true limits of the pine-barrens are perhaps for the first time clearly drawn by Stone in this work, there having been previously considerable difference of opinion as to how far south in New Jersey the true pine-barren element extended. Formerly the pine-barrens were supposed to consist of all the remainder of the state south of their northern edge, but explorations of the botanists of Philadelphia have resulted in a final delimitation of this interesting region. The accompanying map (fig. 1) copied from Stone's book well shows the limits of the pine-barrens. The darker colored portion surrounding the white is not pine-barren in character, and maintains a very different flora from the pine-barrens.

"Some attempt has been made to correlate these areas or parts of them [the coastal plain, including the pine-barrens] with the underlying geological formation, but . . . such correlation is not

[No. 9, Vol. 12, of Torreya, comprising pp. 201–228, was issued 3 September 1912.]

* Investigation prosecuted with the aid of a grant from the Esther Herrman Research Fund, of the New York Academy of Sciences. (Brooklyn Botanic Garden: Contributions No. 4.)

[1] Stone, W. The plants of southern New Jersey, with especial reference to the flora of the pine-barrens. Ann. Rept. N. Jersey State Mus. **1910**: 25–828. Ja 1912.

possible."[2] Notwithstanding this assertion it is the belief of the writer that not only is such correlation possible, but that, in the end, it is doubtful if there be any explanation, other than a

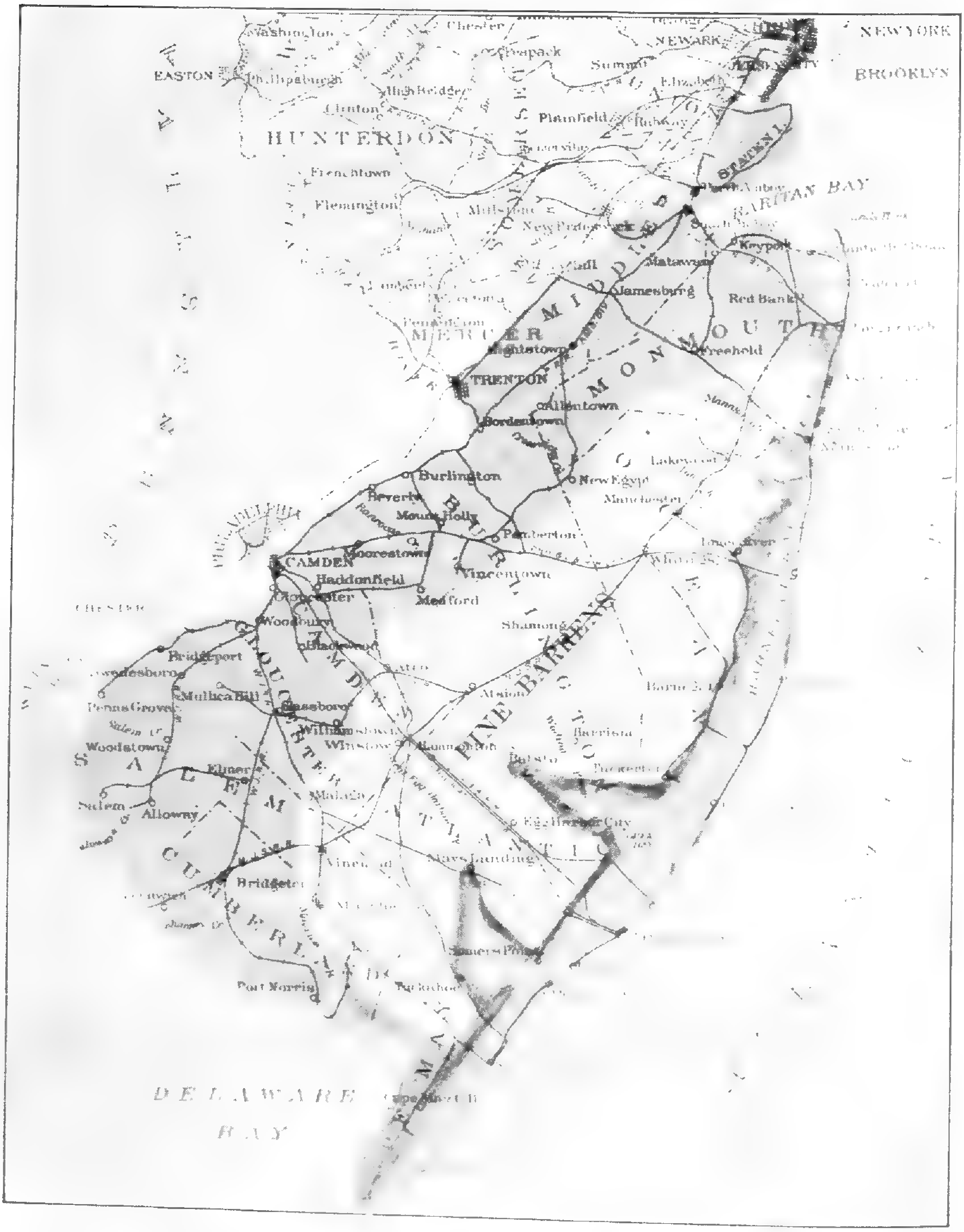

FIG. 1. Map of southern New Jersey. The unshaded area is all pine-barren; the shaded areas are not pine-barrens. Note the shaded areas along the coast and at Cape May. (From Stone's Flora.)

[2] Stone, W. *loc. cit.* 57.

geological one, that will successfully explain the peculiarly local, often endemic, nature of the pine-barrens.

Others have also sought geological explanation for the origin of this region, and one paleobotanist was the first to suggest the possibility of there being any relationship between the flora and the geology of southern New Jersey.[3] It was Hollick's suggestion that the pine-barrens are co-extensive with the Tertiary sands and gravels that Stone's work shows must be revised. Recent collections, the significance of which was, of course, unknown to Hollick in 1899, have led to the abandonment of his theory that the pine-barrens or "coniferous zone" are co-extensive with the Tertiary sands and gravels.

Much later, we find Harshberger[4] attributing the vegetation about the edges of the pine-barrens to the "post Pensauken uplift of the New Jersey geologists," which is perfectly correct. But he follows Hollick in saying that "the Tertiary soils extend southward along the Atlantic Ocean to Florida and are occupied by a pine-barren flora."[5] This, as Stone's work has shown, must be modified. But this statement of Hollick's, subsequently used in Harshberger's work, contains such a large measure of truth in relation to the origin of this unique region, that it is only to be abandoned upon presentation of a theory more nearly fitting the known facts. While the pine-barrens do occupy Tertiary soils, they do not occupy *all of them.* It is just this lack of co-extensiveness of the pine-barrens in New Jersey with the Tertiary that has led to Mr. Stone's scepticism, and to the present effort to sketch what the writer believes to have been the sequence of geological events that has resulted in the final limits of the pine-barrens.

[3] Hollick, A. The relation between forestry and geology in New Jersey. Am. Nat. **33**: 1–14, with map. 1899.

[4] Harshberger, J. W. Phytogeographic Survey of N. Am. 219. 1911.

[5] Harshberger, J. W. *loc. cit.* 218.

Geological History of the Pine-Barren Area[6]

Going back to the time when all the coastal part of New Jersey south of a line from Jersey City to Flemington (see fig. 1) was under water, owing to the last great general submergence of the continent, we find that during this period a great deal of erosion of the unsubmerged land took place. This sinking of the coastal part of New Jersey, and of course elsewhere, known to geologists as the Miocene sinking,[7] had a profound influence on the configuration of the lower part of the state. All the material from the north and northwest that was washed down, or eroded, went out with the water and was finally deposited over this submerged area, and this deposition went on for countless ages. Ultimately this Beacon Hill formation, as the geologists call the deposited material, became very thick, covering practically all the lower part of the state.

"After the deposition of the Beacon Hill formation, the area over which it had been spread was again elevated, and the history of the topography of all that part of the state, which was covered by the formation, . . . dates from this re-emergence of the surface covered by the Beacon Hill formation."[8] This emergence of the land is spoken of by geologists as the Post-Miocene uplift or Pre-Pensauken cycle of erosion. Whatever the terminology used, the result was to bring above water most of the land that had been previously submerged. Not quite all of it, however, for the land was not perfectly level, and only the highest portions came out of the water. Some of what is now the coastal strip of New Jersey, all the Cape May region and much of the lower Delaware Valley, was either not above water at all, or only slightly so, and in the latter case was soon considerably eroded. This cutting down of the emerged Beacon Hill by erosion, particularly to the south and east, was very great, so that finally it was a very different region from the great upland plain it is supposed to have been immediately after the Post-Miocene uplift.

[6] For help in criticising the geological discussion that follows, and for much previous assistance along similar lines I here gratefully express my indebtedness to Dr. Arthur Hollick.

[7] Salisbury, R. D. Geol. Survey of New Jersey **4**: 92. 1892.

[8] Salisbury, R. D. *loc. cit.* 93.

This erosion of the Beacon Hill formation pictured above was brought to an end finally by the gradual subsidence of the whole region. Little by little the lower part of New Jersey sank so

FIG. 2. Map of southern New Jersey at the time of the Pensauken Submergence. All the dotted area was under water, including the Cape May region. The undotted area has not been submerged since upper Miocene times. (*From Salisbury. Geol. Survey N. J.* 4: *pl.* 10.)

that everything but the then upland Beacon Hill formation was submerged (Pensauken Submergence).[9]

The accompanying map (fig. 2) shows the extent of the sub-

[9] Salisbury, R. D. *loc. cit.* 129.

mergence, as everything covered by the dotted area was under water. The undotted light area was not submerged, and has never since been submerged. After an indefinite period of submergence the whole dotted area was again raised so that all of lower New Jersey as we know it to-day came out of the water. The Pensauken formation, which is the geologists' name for most of the material eroded from the uninterruptedly emerged Beacon Hill, was itself subject to erosion, giving us the present characteristic stream beds of the coastal plain in the state.

The next step of serious significance was the encroachment of the ice-sheet, which came down to Perth Amboy, not more than 12–20 miles north of the Beacon Hill formation. At the final recession of the ice there is some evidence of another slight subsidence of the lower part of the state and the coastal region, but not enough to have brought the Beacon Hill formation anywhere near down to sea level. This last subsidence of the coastal strip and the Cape May region had a significant influence upon the distribution of the plants of the area. It seems very probable that a gradual sinking of this region has been going on ever since, as the sea has constantly encroached upon the land throughout maritime New Jersey, as indeed it has in Staten Island, Long Island, and further north.

Whether one follows Johnson[10] in believing that this subsidence of the coastal part of our area is not recent or continuing; or Bartlett[11] that it is both recent and continuing, does not matter so much for our present purposes.[12] Both agree, and the evidence is of such a nature that it appears incontestable, that there was a great deal of ancient subsidence. In Cape May County this has been of such an extent that whole regions covered by forests of white cedar (*Chamaecyparis thuyoides*) have been submerged, emerged, and submerged again. This, repeated several times,

[10] Johnson, D. W. Botanical evidence of coastal subsidence. Science II. **37**: 721. 1910. Science II. **38**: 300. 1911.

[11] Bartlett, H. H. Science II. **37**: 29. 1910.

[12] The writer inclines to the views held by Mr. H. H. Bartlett in this very interesting question of coastal subsidence. Evidence of recent and progressive subsidence seems conclusive, quite apart from any question of fluctuating high tides, which seem to Dr. Johnson to be of so much importance.

has resulted in a great accumulation of buried forests. "Trunks of trees are found buried at all depths beneath the surafce, quite down to the gravel."[13] This and "numerous facts of the same kind . . . collected along the shores of the Delaware Bay and River, in Salem and Cumberland Counties, and on the sea-shore in Atlantic, Ocean, Monmouth, and Middlesex Counties,"[14] all seem to point to a decided ancient subsidence of the area surrounding the Beacon Hill formation.

For the phytogeographer the salient features of these changes are that Beacon Hill has been uninterruptedly out of the water since upper Miocene times, and that it has several times been partly, and often entirely surrounded by water. These facts, together with the encroachment of the glacier, and its recession, with the probable deposition of a great deal of morainic material around Beacon Hill, makes this formation the oldest in New Jersey, either on the coastal plain or in the glaciated regions northward, that could have been continuously covered with vegetation. This, it seems to me, is why the Beacon Hill formation is the controlling factor in the origin and present distribution of the pine-barrens. The area of the pine-barrens (see fig. 1) is not exactly coextensive with Beacon Hill (see fig. 2) but the differences are so slight that recent and local erosion of the formation would account for the failure of the two regions to superimpose, as it were.

In other words the New Jersey pine-barrens exist exclusively on this Beacon Hill formation, an area isolated by geological processes, and maintaining a relict or climax flora, the antiquity of which greatly antedates any of the rest of our vegetation hereabouts, so far as permanency of position and phytogeographical isolation are concerned. This undoubtedly accounts for the composition of the flora, and it is interesting to note that zoölogists have found this same apparent isolation, the same endemism noted above. The sphagnum frog, *Rana virgatipes*, described by Cope and collected only thrice since, is unknown outside of this region,[15] and the late John B. Smith in his work

[13] Geology of the county of Cape May 62. 1857.

[14] *Ibid.* 39.

[15] Fowler, H. W. Proc. Acad. Nat. Sci. Philadelphia **57**: 662–664. 1905.

on the insects of New Jersey has figured the "entomological pine-barrens" as very nearly coinciding with the floral pine-barrens.[16] I have not been able to find any explanation of these curious distributional features, by a zoölogist; but it would seem that perhaps the outline given above may also explain for them the endemism of the pine-barrens.

In the light of this historical outline it should be easy to trace the development of the pine-barren vegetation from the Miocene uplift until the present. Ancestrally it must have consisted of purely American plants, and most of these, in all probability, were of southern extraction.[17] Of the 565 species reported growing in the region, not counting weeds, 386 are listed as truly pine-barren. This does not mean that they are found nowhere else, but that so far as New Jersey is concerned these plants find their greatest development in the pine-barrens. There is a small element among them practically unknown outside of the pine-barrens of New Jersey, such as *Abama americana*, *Sporobolus Torreyanus*, *Eupatorium resinosum*,[18] *Chrysopsis falcata*, and *Juncus caesariensis*.[18] Besides these there are 12 species found predominately in this region, whose distribution is restricted from Massachusetts on the north to Delaware on the south, and whose undoubted distribution-centers are the pine-barrens.

It would seem likely that the 386 pine-barren species mentioned above which are now found elsewhere on the coastal plain have spread there since the release of the Beacon Hill formation from its last isolation. Perhaps future studies may be able to show, even in the pine-barrens themselves, a greater development of the typically endemic pine-barrens in the interior, than is found near the edges where the former and existing tension between other elements has left greater evidences.

At the advance of the ice there must have been a great invasion of northern species, many of which are still found in the pine-

[16] Ann. Rept. N. Jersey State Mus. 1909. Map (frontispiece). 1910.

[17] Over 180 species of the *present* flora range from Virginia to Florida and northward. Of these more than 70 find their northernmost limits in the pine-barrens. The others are found further north, into Massachusetts and Rhode Island. These and subsequent figures are from Mr. Stone's excellent tabulations.

[18] Apparently unknown elsewhere in the world.

barrens. If, as seems probable, no very great refrigeration took place in the area under consideration[19] it is within the realm of probability that the pine-barren vegetation existing then on the Beacon Hill formation, was not very seriously disturbed climatically. We have geological evidence that it was never subjected to any deposition of glacial material or over-wash; it contains no glacial terraces, for its elevation, perhaps greater then than now, precluded this. But the region surrounding Beacon Hill was in no such fortunate position. Having only recently emerged, comparatively, and boasting only a meager altitude it was more or less overrun with the material from the ice. The glacial terraces of the lower Delaware, the nature of the material deposited near Cape May and in Cumberland County all point to a local, or perhaps wide-spread subsidence of the region, which, however, did not affect the Beacon Hill formation as far as possible glacial influence is concerned. Furthermore, there is evidence in the sunken forests at Cape May mentioned above, and in the character of the present vegetation,[20] of the effects of the encroachment of glacial material from the north, by way of the Delaware Valley.

If the ice did not affect the pine-barrens geologically so much as it did the surrounding country, there seems little doubt that it was at this time that many additions were made to the flora of that region. All the following species, ranging as they do from the far north to the pine-barrens of New Jersey,[21] show unmistakable evidences of having come down with the glacier,

[19] This is a conclusion warranted by our knowledge of modern glaciers. While the refrigeration must be very great near the source of glaciers it is a well known fact that at the edges, refrigeration diminishes greatly, particularly where the ice is thin, as it was in all probability near the moraine in New Jersey. It is a common characteristic of glaciers that plants are found almost up to the edge of the ice and sometimes on it. See Muhlenbergia **7**: 103, 111, 121. 1912.

[20] Mr. Stone has collected many plants at Cape May unknown in the pine-barrens, and some not known elsewhere south of the "fall line." The present distribution of *Tsuga canadensis* in New Jersey is also probably attributable to the factors noted above. It is common along the drainage of the Delaware River in lower New Jersey (the region of glacial terraces) but unknown in the pine-barrens. It is, of course, common northward. See Stone, *loc. cit.* 93.

[21] Some are now found elsewhere in New Jersey, but, as I have shown above, probably because of their subsequent migration from Beacon Hill.

and of having become isolated in bogs and other edaphically favorable locations, such as probably were only to be found on Beacon Hill at that time: *Triglochin palustris*, *Panicularia obtusa*, *Scirpus subterminalis*, *Carex livida*, *C. exilis*, *Utricularia intermedia* and *Aster nemoralis*. There are a good many more,[22] and the same phenomenon has been noted by entomologists. Prof. Smith writes of *Trechus chalybeus*, and a few other insects, that "the only trace of real boreal species has been found in the deep cold swamps of Ocean County."[23]

In this connection the distribution of the most remarkable plant of the pine-barrens, *Schizaea pusilla* is very interesting. It is found only in the pine-barrens and in Nova Scotia and Newfoundland, and is unknown between these points. If Dr. Scharff's recently proposed theory[24] that perhaps parts of Nova Scotia and Newfoundland remained unglaciated through all the period of the Pleistocene is correct, then it is not impossible that *Schizaea* is a relict in the pine-barrens of its southern migration, and that it is also a relict in the north, all the intervening territory having been preëmpted first by the ice, secondarily by more "agressive" plants after the recession of the ice. This is little more than interesting speculation, but Scharff, whether wrong or right in his contention, has opened up a wide field of discussion. It is certainly significant that *Schizaea* is not found in the unquestionably glaciated country, and is found only in the pine-barrens and in the [probably] unglaciated northeast.

Another feature of the pine-barrens which may support the theory that they are a very ancient and isolated phytogeographical entity is the number of parasitic, saprophytic and mycosymbiotic plants that grow there. Cowles,[25] in his recent treatment of those plants not wholly dependent on their own roots for food, has made the suggestion that the origin of the parasitic, saprophytic, and mycosymbiotic habit may have

[22] Stone, W. *loc. cit.* 49, 50, and 76.

[23] Ann. Rept. N. Jersey State Mus. **1909**: 30. 1910.

[24] Scharff, R. F. Distribution and origin of life in North America. New York. 1912. For further data on this point see also Adams, C. C. The Post-glacial dispersal of the North American Biota. Rept. Int. Geog. Cong. **8**: 623–637. 1904.

[25] Coulter, J. M., Barnes, C. R., and Cowles, H. C. Text-book of Botany. **2**: Ecology, 775 and 799. 1911.

been mere chance at first, then increased perhaps by the greater ease of one species as against its neighbors in getting its food, or to the failure to get food without some such reciprocal relation. The inference that this non-autophytic habit is due to isolation and consequent necessity of seeking other than "regular" methods of getting food, in a region, perhaps ancestrally offering an inaccessible food supply, may not be without significance. It is certainly of interest in this connection to note the well known high percentage of monocotyledons,[26] Pinaceae, Fagaceae, Scrophulariaceae, and Ericales, all of which are mostly non-autophytic.[27] So far as Orchidaceae and some of the mono-cotyledonous families are concerned the number of *species* is disproportionately large as compared with the surrounding country. Among some families, Fagaceae, Pinaceae and Ericaceae for instance, it is the number of *individuals* that is so great, forming practically exclusive growths in the case of *Pinus rigida* and *Chamaecyparis thuyoides*. This very general prevalence of the non-autophytic habit may have had something to do with the failure of many wholly autophytic plants, surrounding the Beacon Hill formation, to gain a foothold there, for the mutual exclusiveness of the diverse habits is obvious. There may, however, have been quite other factors operative here than antiquity and isolation. It would be interesting in this connection to compare the flora of the pine-barrens with some other region of similar geological antiquity. The driftless area of Wisconsin seems, at first thought, to be similarly conditioned geologically, but there is evidence that it could not have been steadily vegetated during the Pleistocene, as it was covered by water during some part of this period.[28]

The extra-territorial distribution of some of the typical pine-

[26] Stone, W. *loc. cit.* 75. See also Harper, R. M. Torreya **12**: 224. 1912. Torreya **5**: 207–210. 1905.

[27] According to E. Stal (Der Sinn der Mycorhizenbildung, in Jahrb. Wiss. Bot. **34**: 539–668. 1900) in the following families many, if not all the species, are mychorhizal, Orchidaceae, Amaryllidaceae, Liliaceae, Caryophyllaceae, Saxifragaceae, Fagaceae, Papilionaceae, Gentianaceae, Ericaceae, Scrophulariaceae and Coniferae. There are many other individual cases.

[28] Chamberlain, T. C., and Salisbury, R. D. Driftless area of the Upper Mississippi Valley. Ann. Rept. U. S. Geol. Sur. **6**: 199–322. 1885.

barren flora contributes some data that support the views outlined above. Particularly the finding of *Xerophyllum*, *Helonias*, and *Oceanorus*, to mention only a few, on the mountains of eastern Tennessee, is of interest. These and many more were found by Kearney[29] and more recently by Small, in geologically the most ancient area in America (Archaean). The hiatus in the distribution of these plants between the pine-barrens and these very old mountains is easily explainable by the isolation theory above advocated. The fact that they are wanting or very rare in the intervening territory would seem to present strong evidence of the unavailableness of this intermediary area (most of it was under water), during the geological changes described above, for the perpetuation of the species now so far isolated. Furthermore this southern isolation strongly favors the statement made above that most of the pine-barren flora was of southern extraction, for it is quite reasonable that the species found on the Tennessee mountains and in the pine-barrens of New Jersey are simply relicts of an ancient American southern flora that must, at one time, have covered a vastly greater area than it does to-day. The present nearly complete isolation and the post-glacial distribution of this southern flora, both it seems to me, favor this view.

There remains still to be considered the "pine-barren" plants of Long Island and Staten Island, not to mention regions further east. As Stone has shown a good many of these alleged "pine-barren" plants are only coastal plain plants,[30] which are found, it is true, in the pine-barrens; but more commonly in the area surrounding them, frequently throughout the Atlantic seaboard from Massachusetts to Florida. It should be remembered in this connection that neither Long Island nor Staten Island are in the same geological category as Beacon Hill. For both the former were in part covered by the glacier and both were more or less within the influence of glacial activity.[31] It is, of course,

[29] The pine-barren flora in the East-Tennessee Mountains. Plant World 1: 33–35. 1897.

[30] Stone, W. *loc. cit.* 73.

[31] Long Island was not covered wholly by glacial drift, but the sandy plain south of the moraine received considerable overwash material, now mixed with the underlying Tertiary sand and gravel.

a matter of pure speculation whether any vegetation persisted during the Pleistocene on Long Island or not, but evidence seems to point to the negative probability. If this is true then all of the New Jersey flora now found on Long Island must have had a post glacial origin. The distribution of *Pinus echinata, P. virginiana* and the red squirrel may throw some light on the post-glacial chronology of events on Lond Island. Both these pines are found in the region surrounding the pine-barrens, but are unknown, or very rare in them. *Pinus rigida* the predominant tree of the barrens is common on Long Island, but the two pines mentioned above and the red squirrel are not known on the island.[32] From the geological outline given above we know that *P. virginiana* and *P. echinata* must have occupied the region surrounding the pine-barrens long after the last effects of the ice were past. This may also have been true of the red squirrel. At any rate, after a large post-glacial migration of alleged "pine-barren" plants, the avenue of migration must have been broken. The discontinuance of this passageway must, it seems to me, have been the controlling factor in the failure of *Pinus echinata, P. virginiana* and the red squirrel to reach Long Island. It is curious in this connection that both the pines, but not the animal, are found on Staten Island. The geological events causing this very decided cut-off are outside the scope of this paper. It may, however, have been something other than geological phenomena operating here. There are, of course, many more species than these pines, which apparently reach their northern distribution point in the region surrounding Beacon Hill, or in Staten Island, never having been reported from Long Island. It seems probable that they came northward in post glacial times, too late to avail themselves of the already destroyed avenue of migration.

One other extra-territorial occurrence of pine-barren species should be noted. A widely quoted paper of Britton's[33] is often cited in support of the theory that pine-barren plants are not

[32] The reported occurrence of *Pinus virginiana* in Suffolk Co., L. I., by Miller and Young cannot be verified. It was probably a misdetermination of *P. rigida*.

[33] Britton, N. L. On the existence of a peculiar flora on the Kittatinny mountains of northwestern New Jersey. Bull. Torrey Club **11**: 126–128. 1884.

strictly confined to their supposed home, and that their occurrence in edaphically favorable places in the Kittatinny mountains was an example of such phytogeographical instability. A careful reading of Dr. Britton's paper shows that not only did he make no such claim, but that all the plants mentioned there, with one exception, are not pine-barren plants, strictly speaking, at all. They are all merely plants of the sandy coastal plain, *Corema Conradii*, a true pine-barren plant, being the one exception. The distribution of this species and of the many others now found isolated outside of the pine-barrens, is to be sought in the post-glacial history of the region to the north. In the general vegetative scramble, so to speak, to cover the country uncovered by the retreating ice, it seems natural that those plants whose ancestral home had been in sand, should "choose" sand as a stopping place. It would, in reality, be strange if they had done anything else, and it is significant that all the plants mentioned by Britton are sand plants.

All of these evidences,—the geological history of the country, the isolation of Beacon Hill and the consequent isolation of the ancient pine-barren flora upon it, the post-glacial migration of some of the pine-barren species, and finally the present distribution of the pine-barrens, coinciding as it does so closely with the Beacon Hill formation, seem incontestably to point to a geological explanation of the origin and present distribution of the pine-barrens. Such a conception of the origin of this phytogeographical region entails a readjustment of our ideas as to the relative age of the flora and of some related phenomena; for, if this theory is correct, then the pine-barrens can no more be considered as a new or pioneer vegetation, but rather as an old and climax condition, ancestrally infinitely more ancient than anything in the surrounding area.

Brooklyn Botanic Garden

A FEW NOTES ON THE CHEMICAL COMPOSITION OF BEE BREAD

By Ruth L. Phillips

During the past year I have been studying the growth changes in the nerve cells of the honey bee, *Apis mellifica*. Since nutrition plays a very important part in such changes throughout the life history of the insect I was interested to ascertain the chemical composition of the nitrogenous food of bees. This is popularly called bee bread, and consists mainly of the different kinds of pollen collected by the insects on their foraging expeditions which is mixed with a small amount of honey and wax. Such pollen is probably representative, in its chemical content, of pollen in general. Therefore I am giving the results of the chemical analysis in case they might prove interesting to botanists.

The time at my disposal was not long, so it was impossible to make more than one analysis, but still this represents, in the main, several analyses, as each determination represents the average of a series, several samples being taken and the final results computed as the averages of these. Therefore, with the exception of the wax to which I will refer later, the following figures represent approximately the composition of such pollen as is stored by the average hive of bees in mid summer. The sugar content is undoubtedly high for pure pollen since a certain amount of honey is used in making the bread.

Bee bread and bee's wax both oxidize at a low temperature. For this reason the water was determined by drying in vacuo over concentrated sulphuric acid, necessarily a rather slow process. Had the presence of wax been suspected I should have determined it in the same way. However when its presence was discovered there was only time for a hasty determination by drying in a water oven, so the figures for the wax are much too high. As this is in no way a food, acting probably as a preservative, it does not affect the analysis of the pollen as such. Dr. Phillips, Bee Expert for the Department of Agriculture, suggests that this wax may have come from carelessness in removing the pollen from the cells. However, this very thing was carefully avoided, and although it is somewhat difficult to get the pollen without getting wax at the same time, I am certain that there could not have been enough obtained in that way to give the percentage resulting, even when corrected for the oxidation which occurred.

As one would naturally expect, there was a large amount of water in this substance, 12.75 per cent. being obtained. The bulk of the remainder is protein, 64.4 per cent., not too high when we remember that pollen is mainly protoplasm. 9.23 per cent. of fat were found. A peculiarity of this fat is worth noting. It appeared to be made up of several oils, some of which were extremely volatile and had a very penetrating disagreeable odor. Both cane sugar and sucrose were present, the total sugar content being 9.5 per cent. of which 1.3 per cent. was cane sugar, and 8.2 per cent. sucrose. The wax would probably give between three and five per cent if a more accurate determination were made.

	Per Cent.	
Water........	12.75	(Would vary with conditions.)
Protein	64.4	(Probably constant to a fraction of a per cent.)
Fat...........	9.23	(Probably constant to a fraction of a per cent.)
Sugar.........	9.00	(Would vary with the amount and kind of honey.)
Wax	3 to 5	(Probably fairly constant.)

It would be interesting to analyze several pollens and compare them with the above composite pollens. In fact for a standardization of pollen such a scheme would be necessary. Yet since the amounts of the different substances that go to make up protoplasm do not vary greatly it is a question whether a series of analyses of the different pollens would differ to any great extent from the above analysis of the mixed pollen.

Syracuse University

TRAGOPOGON IN COLORADO

By T. D. A. Cockerell

Some years ago (1905) I noted that two species of *Tragopogon* were growing in Boulder, Colorado. Upon examination, they appeared to accord excellently with the two species credited to our flora, *T. pratensis* L. and *T. porrifolius* L., and I accordingly paid no more attention to the matter. Later, I found a plant with intermediate characters, which was recorded as a hybrid between these species. This year I discovered that instead of two species, we had three; a second yellow-flowered form occurring in some abundance but quite locally on Tenth street. This caused me to collect a quantity of fresh material, which was described in detail. Having little European literature, I found it difficult to be sure of my species, and so sent particulars to Mr. Paul. C. Standley at the National Museum, requesting him to look in the European books. This he very kindly did, with the result of substantially confirming my guesses regarding the identity of the plants. *Tragopogon* as represented at Boulder may be described as follows:

TRAGOPOGON L.

Flowers purple; involucral bracts normally 8 to 10. *porrifolius* L.

Flowers very pale purplish; involucral bracts 9 to 13. *porrifolius* × *dubius*.

Flowers chrome yellow; involucral bracts 8; leaves twisted. *pratensis tortilis* Pritz.

Flowers lemon yellow; involucral bracts 13, rarely 8; leaves straight . . . . *dubius* Scopoli.

Tragopogon porrifolius L.

Corolla purple; stigma purple; anthers black, ochreous marginal lines faint or absent; involucral bracts 8 or 10 in a head, 8 is the commoner number, one plant had heads with 8 and heads with 10; bracts entirely green, extending about 10 mm. beyond ends of lateral corollas; tips of pappus purple, subapical hairs pale brown; fruiting heads broad at base, the stem below strongly, not abruptly, swollen; foliage normal, leaves straight. Very abundant.

Tragopogon porrifolius × dubius hyb. nov.

Corolla very pale purplish; stigma pale grey; involucral bracts 9 or 13, extending about 9 mm. beyond lateral corollas; pappus pale; foliage normal. Scattered plants, where *porrifolius* and *dubius* grow together. A plant I watched for seed proved entirely sterile.

Tragopogon dubius Scopoli

Corolla clear lemon yellow; stigma gray or blackish; anthers black, with ochreous marginal line; involucral bracts normally 13, but 8 in smaller plants; bracts entirely green, extending about 10 mm. beyond lateral corollas; tips of pappus and subapical hairs very pale brownish, not at all purple; fruiting heads not greatly broadened at base, but stem below greatly, but not at all abruptly, swollen; achenes very strongly tuberculate; foliage normal, the leaves straight. The heads are about 2½ inches broad when well developed. Abundant.

Mr. Standley, after seeing a head and my notes, wrote: "seems to be known in Europe as *Tragopogon pratensis minor* Fries. Probably this is the same as *dubius* Scop., at least so far as one can tell from the descriptions. Some authors cite the two as synonyms." My plant agrees very closely with the description of *T. dubius* in Wilczek and Schinz, Flore de la Suisse (1909), p. 629. The only discrepancy is in the number of bracts, which these authors give as 10 to 12.

Tragopogon pratensis tortilis Pritz*

Corolla chrome yellow (dandelion yellow); stigma clear pale orange; anthers black on outer side except at base, with ochreous marginal line; involucral bracts constantly 8; outer bracts with very conspicuous purple margins; bracts not extending beyond corollas; pappus colored as in *dubius;* fruiting heads very broad at base, but stem below little swollen; margins of leaves crinkled, wavy (but straight when flattened out), ends of leaves much curled, many of them corkscrew-like.

Mr. Standley says that this is *T. pratensis tortilis* Pritz, of which *T. undulatus* Reichenb. and *T. pratensis undulatus* Thuill. are synonyms. The Index Kewensis gives *T. tortilis* Pritz, Ic. Ind. ii, 275, and *T. undulatus* Thuill., Fl. Par. ed. II, 396 (not *undulatus* Jacq.); both as synonyms of *pratensis*.

*Since this was written I have (Aug. 1912) found *tortilis* in a garden at Santa Fé, N. Mex.

Later, Mrs. L. A. Moore brought me a number of heads from the other side of Boulder, which proved to be as follows:

(1) *T. dubius;* normal, but with 12 involucral bracts, going 10 mm. beyond corollas.

(2) *T. porrifolius;* normal, with 8 bracts.

(3) *T. porrifolius,* variety. Flowers pale lilac; 8 involucral bracts. Two specimens, in one the bracts going 5 mm. beyond flowers, in the other only as far as ends of corollas.

(4) *T. porrifolius,* variety. Flowers pale lilac as in 3, but rays very short, the total length of corollas of outer florets about 23 mm. The bracts, 10 in number, go about 17 mm. beyond corollas.

Are numbers 3 and 4 F_2 hybrids from *dubius* × *porrifolius ?* I cannot now find any typical *T. pratensis* in Boulder.

REVIEWS

Halls' Yosemite Flora*

Among the large number of books on out-of-door life we have seen none as attractive or as serviceable in make up as Professor and Mrs. Hall's "Yosemite Flora." The pigskin cover, the natural colored paper and the pocket size make it an almost irresistible companion to one interested in the wonderful flora display of Yosemite. Indeed the authors and their publishers have set a new standard which writers of popular books on natural history may well emulate.

Nor is the pleasing appearance the only virture of the new flora. A casual thumbing of the pages discloses several half-tone plates illustrating some of the floral attractions of the park and many well-drawn text figures that greatly enhance its value. An introductory chapter discusses in a very readable style the general floral features and life zones of the region. Another chapter gives clear concise directions to the novice in the use of the keys and explanations of the botanical terms.

From the preface we learn that nine hundred and forty-five

* Hall, Harvey Monroe, and Carlotta Case. A Yosemite Flora. Pp. vii + 282. Paul Elder & Company, San Francisco. 1912. $2.00.

species and varieties are described, and that "the total number represented in the Yosemite National Park is considerably greater, since the grasses, sedges and rushes are here omitted." The omission of the grasses and related plants is probably justified since the book is planned primarily for the amateur and tourist, but without them botanists and foresters interested in the grazing problems of the Sierra Nevada will find the book seriously lacking.

Turning with a more critical eye to the text we find carefully worked out keys to the genera and species which will add much to the usefulness of the book. In the descriptive part emphasis is placed upon the species. The generic and family descriptions are brief, or when represented by a single species omitted entirely. In the conception of generic and specific lines the authors have been very conservative. They recognize, for instance, only one rose, which they term *Rosa californica;* as a matter of fact there are two roses in the region, neither of which, in our opinion, is typical *R. californica*. Again, *Castilleia parviflora* and *C. miniata* are included although students of the genus have long since recognized the Sierra Nevada plants as distinct from those northern species. Of course these are not serious defects, especially in a book planned for the amateur. The plant geographer, however, must needs be on his guard in using it for gathering data on plant distribution. But in many regards the "Yosemite Flora" is the best book that has appeared on the California flora since the "Botany of California." And although it nominally covers only a small section of the Sierra Nevada it will be found very useful throughout the mountain range.

L. R. Abrams

Gager's Review of Payne's Laboratory Manual of Experimental Botany.—A Reply

The review of Payne's Manual of Experimental Botany for high schools contributed by Dr. Gager in the June Torreya interested me considerably for two reasons: first because of my personal acquaintance with Mr. Payne, whom I know to be a very successful teacher of high school botany, and second because I find in his text as published the method of approach which makes his work successful. It seems to me that in a review of the length of Dr. Gager's—three pages—the good points of Mr. Payne's book deserve more than a six line paragraph, and I hope in the following discussion to show reason for this opinion.

Dr. Gager's review begins with a criticism to which it seems to me strong objection may be raised in point of fact.

This relates to the general plan of the text in which Dr. Gager finds as one of the main weaknesses of the book "that botany is continually correlated with practical gardening, farming, and bacteriology." And further, to quote the reviewer, "Undoubtedly the movement to introduce the study of the principles of agriculture into secondary schools is a movement in the right direction, but why agricultural matter should be eternally mixed in with botany until the latter science loses all semblance of its real self, it is difficult to comprehend."

It appears to the writer that Dr. Gager's objections to correlating theoretical and practical plant study must have arisen from a misapprehension of the purpose of Mr. Payne in such correlation. One of the main difficulties in teaching elementary botany in high schools lies in finding an approach to the student which shall have interest for him, and ready connection with his previous knowledge. The experimental method of Mr. Payne's text-book is admirable for securing the pupil's interest, and the continual references to what may be spoken of as the applied phases of botany serve to clinch the facts in the pupil's mind as well as to explain the reasons for many common phenomena and their relation to plant life. And further the only facts about plants possessed by the ordinary city boy relate to their uses as food, drugs, lumber, clothing, etc. A country boy has additional knowledge of living plants and agricultural processes. Mr. Payne has endeavored to make useful this fund of knowledge by frequent references to the uses of plants and their culture in connection with the purely botanical study of the structure and function of typical plants. It is, of course, not to be expected that all the exercises are as equally useful in the city as in the country, but they are in number sufficient to allow for the selection of an ample year's course in either situation.

There is another reason why a course designed to correlate theoretical and applied plant study is very timely. The majority of high school pupils who enroll do not finish half the high school course, much less enter college. The purely theoretical course in botany, along the lines laid down by the college entrance committee, has little more than a slight disciplinary value for the ordinary high school pupil. A high school course in botany which is designed mainly to prepare for college requirements is in the same class with the high school Latin work which is or used to be designed to prepare the student eventually to enjoy reading classical Roman literature in the mother tongue.

Botany for botany's sake is no longer an issue for the high school curriculum. Mr. Payne's text represents a step in the direction of a practical course for high school pupils. The value of the entire course as outlined can be determined only by actual use, but, it may be stated, much of it has already proved its value in first year high school work.

With respect to other criticisms which Dr. Gager has made which have to do mainly with details of accuracy and completeness, many of them are probably justified but even some of these are more or less excusable as inherent in the plan of the book.

The book consists almost entirely of exercises directing the pupil's observation and requiring some constructive thought on his part in carrying them out. The exercises cover, in the course of the book, the entire field of botany, the arrangement of matter being in general like that in most elementary texts. Scattered along in connection with the exercises are occasional brief notes which constitute the didactic matter of the book. The information given in these is such as could not possibly be learned by the inquiries of the pupil. The teacher is thus afforded full opportunity to lead the pupil to derive for himself the conclusions and generalizations proper to each exercise. The few definitions given are such as the pupil might be led to construct from the work done, and which he can entirely comprehend. They are thus liable to be somewhat incomplete and inaccurate, but the more complete and accurate definitions of most texts have the disadvantage of being only partly comprehensible as a result of class room work, the acquisition of the remainder being purely memory work.

Mr. Payne's book thus calls for a minimum of teaching by authority and a maximum of self-help by the pupil. In this method a much greater responsibility rests with the teacher but the results should more than compensate.

In conclusion brief reference may be made to another recent review of Mr. Payne's book (Bessey, C. E., Science II. **35**: 994. 1912). Prof. Bessey's main criticism is that the book follows too exclusively the single method of approach, the experimental. This fact finds its main defence, as noted above, in the purpose of the book to teach by the pupil's endeavor rather than by that of the teacher. The lack of expository matter certainly has some drawbacks but it seems to be a necessary defect of the virtues of the book. The ideal text will perhaps have the loose-leaf system, with experiments and expositions separate so that the pupil need not be given the latter until his work with the former is complete.

Another fault noted by Prof. Bessey has to do with the repletion of exercises, too many to be covered for a year's course, but he also finds much to commend in the form and matter of the exercises and suggests that teachers may with profit use the book as a source from which to draw experiments as needed.

It is to be hoped that Mr. Payne's book may receive the thorough working out to which, with its many merits, it would seem to be entitled. Defects it has without question, but these are mainly minutiae which can easily be rectified. The ultimate value of the plan and method can only be determined by the test of actual use.

R. C. Benedict

High School of Commerce,
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NEWS ITEMS

The Rocky Mountain Herbarium has had collectors during the season in several of the western states. Professor Aven Nelson, accompanied by two of his students, J. Francis Macbride and Dorman Bennitt, spent the latter part of June and the early part of July in southwestern Idaho and northern Nevada. Through the courtesy of the Forest Service men connected with the Humboldt Forest, Mr. Macbride was enabled to remain in the field throughout the season, working various districts in that forest. The collections from these two states are in duplicate and will be worked up as rapidly as circumstances will permit.

Mr. Ernest P. Walker, another student of the University of Wyoming, has been collecting since late June, in southwestern Colorado, in Paradox Valley. He has extended his observations into the adjacent mountains of Utah. These collections are also in duplicate, and, it is hoped, will be available before the end of the school year.

Dr. H. W. Anderson has been appointed Rose professor of botany at Wabash College, and Professor J. S. Caldwell, of the University of Nashville, has accepted the professorship of botany in the Alabama Polytechnic Institute, Auburn, Alabama.

R. Heber Howe, Jr., of the Thoreau Museum, has received the degree of Docteur de l'Universite from the Sorbonne for research carried on at that university during 1911–12. His thesis was on the "Classification de la Famille des Usneaceae dans l'Amerique du Nord."

The following appointments are announced at New Brunswick, N. J.: Mr. J. P. Helyar, seed analyst of N. J. Agricultural Experiment Station and instructor in botany at Rutgers College; Mr. C. A. Schwarze, assistant state plant pathologist, N. J. State Board of Agriculture; Mr. G. W. Martin, assistant plant pathologist for the experiment station; and Miss Marion G. Pleasants, laboratory assistant in the botanical laboratory of the experiment station.

Miss Jean Broadhurst, of Teachers College, Columbia University, has a year's leave of absence and is spending the time at Cornell University studying plant physiology and bacteriology.

Professor Hugo de Vries planted a tree and delivered a lecture for the Brooklyn Botanic Garden on September 14. On September 16 he lectured on "Experiments in Mutation" at the New York Botanical Garden. In the evening a dinner was given to 26 botanists in honor of Professor de Vries by Professor R. A. Harper, of Columbia University.

Professor Geo. R. Lyman will spend a year's leave of absence from Dartmouth College as lecturer on botany at Harvard University, carrying the work of Professor Roland Thaxter, who is to visit Trinidad and neighboring islands.

Professor Charles A. Shull, for the past five years in charge of biology in Transylvania University, Lexington, Ky., has been appointed assistant professor in the botany department of the University of Kansas, where he will give the courses in plant physiology and genetics.

Extensive changes are being made in the biological department at DePauw University, Greencastle, Ind., that will give increased capacity for the work of the department. The lecture room will be more than doubled in size and the laboratories will be far better lighted than formerly.

Mr. T. W. Moseley, assistant in agricultural botany in the University of Nebraska has returned from the University of Chicago, where he was taking work in plant physiology during the summer.

Mr. F. E. Miller, of the University of Missouri, was appointed assistant horticulturist at the Virginia Truck Experiment Station and entered upon his duties September 1, 1912.

Mr. Ray E. Torrey, recently an assistant in the department of botany at the Massachusetts Agricultural College, will teach biology at Grove City College this year.

On July 16 Dr. George H. Shull, of the Station for Experimental Evolution, lectured at the Marine Biological Laboratory, Woods Hole, Massachusetts, on "The bearing of cross and self fertilization in heredity and evolution." He also took occasion on the same trip to visit the Bussey Institute of Harvard University.

Professor J. J. Thornber, botanist to the University and Experiment Station of Arizona has just returned to his work after a twelve months leave of absence. Professor Thornber has spent the past year at the Smithsonian Institution in Washington, D. C., where he has been engaged in writing a manual of the flora of Arizona.

Mr. J. S. Cooley, assistant in plant pathology in the Virginia Experiment Station, will occupy a fellowship at the Missouri Botanical Garden during the coming academic year.

A botanic garden of one and a half acres is being developed at Grinnell College, Iowa, under the direction of Professor Henry S. Conard. It is primarily a teaching garden, and now contains about 300 species and varieties of herbs and shrubs.

Miss Elena R. Prats, who recently graduated from Columbia University, has accepted a position as instructor in biology in the College of Agriculture and Mechanic Arts of the University of Porto Rico.

Professor Thomas H. Macbride, professor and head of the department of botany, State University of Iowa, has been granted leave of absence for the year 1912–13, and is spending the year in botanical exploration in the western states. The latter part of the summer was spent in a mycological survey of the region near the snow line of Mt. Ranier with special reference to the Myxomycetes of that locality.

Mrs. Blanche Trask, of Los Angeles, California, who has brought to light many interesting facts about the peculiar flora of Santa Catalina Island, is recovering from a long illness, and is shortly to return to Santa Catalina to pursue further field studies.

Mr. F. Tracy Hubbard, of the Gray Herbarium, spent the summer in the study of the Gramineae at the grass herbarium of the United States Department of Agriculture and in field work in Maryland and Virginia.

Professor A. S. Hitchcock, systematic agrostologist of the

United States Department of Agriculture, has gone to the West Indies for the purpose of studying and collecting grasses. He is accompanied by his son, Albert E. Hitchcock, as assistant. They will go first to Jamaica and later to various points in the Windward Islands, probably visiting last the island of Trinidad.

Dr. F. D. Heald, until recently professor of botany at the University of Texas, has moved to the University of Pennsylvania to accept the position of pathologist of the Chestnut Tree Blight Commission.

Professor Guy West Wilson, of the North Carolina Agricultural Experiment Station, was awarded a research scholarship at the New York Botanical Garden for the month of September to aid him in his researches on parasitic fungi. Mr. Wilson will continue his work during the year as a graduate student of Columbia University.

We learn from *Science* that the late Mr. Allan Octavian Hume, known as an ornithologist and botanist, bequeathed about £14,000 to the South London Botanical Institute, to which in 1907 he gave £10,000.

The botanical work at the University of North Dakota is being extended this year under the direction of Dr. Melvin A. Brannon. Miss Norma Pfeiffer, of the University of Chicago, and Miss Mabel Olson have been made assistants. A teaching and experimental greenhouse is being constructed and a liberal addition is being made to the equipment of the physiological laboratory.

Dr. Vladimir Doubiansky, conservator of the Imperial botanical gardens at St. Petersburg, who is now travelling with the geographers, spent a day at the University of Washington, looking over the botanical equipment at that institution.

Dr. Edith M. Twiss, assistant professor of botany and dean of women in Washburn College, has been promoted to the position of professor of botany.

Dr. and Mrs. N. L. Britton have returned from the island of Bermuda, where they have been spending a month with Mr.

Stewardson Brown, of the Academy of Natural Sciences, Philadelphia.

Professor A. F. Blakslee has a year's leave of absence from the Connecticut Agricultural College. He has a temporary appointment on the staff of the Carnegie Station for Experimental Evolution at Cold Spring Harbor, L. I., N. Y., where he will spend the year in research work on the lower fungi.

Dr. Ira D. Cardiff, professor of botany in Washburn College, has been appointed professor of plant physiology and plant physiologist of the Experiment Station of the Washington State College at Pullman.

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TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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THE TORREY BOTANICAL CLUB

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TORREYA

November, 1912.

Vol. 12 No. 11

THE RELATION OF SNOW COVER TO WINTER KILLING IN CHAMAEDAPHNE CALYCULATA*

By Frank C. Gates

During the course of a piece of investigation at the University of Michigan during 1910–1912, some interesting observations and measurements were made upon *Chamaedaphne calyculata*, a heath plant which grows in the peat bogs of the vicinity.

The winter of 1910–11 was normal for southern Michigan. No extremely low temperatures were recorded and the snow, although above the average during the early part of the winter, was below it during the coldest weather, so that at the time of severest cold (– 20° C.) the bushes of *Chamaedaphne* were less than half protected. The cold spells were of short duration, however.

The winter of 1911–12 was extreme both in amount and duration of cold and of snow. New records were set both for the absolute minimum and for the duration of severe cold.

Before entering into the main subject a brief account of the vegetational history of *Chamaedaphne* will be advantageous. During the early part of a growing season the shoots of the year develop large (2–4 cm. long) leaves. Towards the end of the growing period small leaves, in whose axils are flower buds, are produced. Both large and small leaves remain on the bush over winter. With approaching winter the green color of the leaves is replaced by a dark reddish brown, the petioles become red, and the leaves bend up into an upright position. With the

* Contribution from the Botanical Laboratories of the University of Michigan, No. 135. Spelling changed from the form recommended by the Simplified Spelling Board, to conform to the usual procedure in Torreya.—Ed.

[No. 10, Vol. 12, of Torreya, comprising pp. 229–256, was issued 4 October 1912.]

advent of spring the leaves gradually regain their green color and their summer position. The flowers appear early in spring, and later the shoots of the year appear from nodes back of the inflorescence. As these shoots develop the older leaves gradually die and drop off.

FIG. 1. General view in the Mud Lake Bog at the time of deepest snow, showing the *Chamaedaphne* covered with snow except where exposed by brushing away the snow from a path. Spruce and tamarack in the background. March 16, 1912.

At the time of blooming in 1911, during the latter part of April, the bushes were green clear to the tops and flowering was profuse. Although dead leaves and flower buds could be found here and there, their presence did not affect the general appearance of green vegetation.

The spring of 1912 was radically different. Blooming was later, occurring in the first week of May and, although rather profuse, the general impression was one of dead brown leaves and dead flower branches. Only by looking very carefully or better by walking among the bushes could one really realize that the plants were in bloom and that the old leaves had greened-out.

A most striking feature however was the remarkable transition between flowers in bloom, and greened-out leaves and dead leaves and buds, which occurred about two thirds to three fourths of the height of the bushes from the ground. It was noticeably higher in the centers of large bushes and in wind-protected areas and lower in wind-swept and less protected areas. It corresponded remarkably to the general level of the snow which partly covered the bushes during the severe and unusually prolonged cold weather of February, 1912.

FIG. 2 A view in the Mud Lake Bog at the time of flowering, showing the dead buds at the tops of the bushes. The snow level was about 70 cm. May 9, 1912.

Observations had been made nearly every week all winter and before the severest cold weather the snow was 50 to 66 cm. (20–26 inches) deep in the *Chamaedaphne* association, varying according to the exposure to wind. All during the very cold weather the depth of snow at First Sister Lake, west of Ann Arbor, Michigan, was more than 20 inches and in places reached heights of 75 to 90 cm. (30–35 inches) on the general level of drift.

At Mud Lake, north of Ann Arbor, where *Chamaedaphne* occurs in the openings in the spruce and tamarack, the snow was regularly deeper, a general level being 80 to 90 cm. (31–36 inches) and up to 110 cm. (43 inches). In wind-sweeps the snow level during the very cold weather was about 50 cm.

In order to express the results other than through general impression by eye, in May, 1912, the per cent of dead flower buds out of the total number of buds produced in the spring of

FIG. 3. Twigs of *Chamaedaphne*, in the upper the outer end killed. (From material collected at Mud Lake, May 9, 1912.)

1911 was ascertained for different levels above the ground. Strips 20 cm. wide running from the outside of the bush to the center were selected and the total number of blossoms and dead buds were counted in 10 cm. intervals from the ground to the top of the bush and the results tabulated.

In every case where bushes had been entirely covered with snow, the per cent of blossoms was 98–100 per cent of possibility. Where the bush was only partly covered, at the snow level, there was an abrupt change in the per cent of blossoms from about 80 per cent and higher to less than 30 per cent and to zero in the tops of the higher bushes. When flowering occurred at all above the snow line it was only the basal two or three buds, while a flowering shoot normally contains about a dozen flowers (6 to 19).

One might say that it was natural for the outer parts of the *Chamaedaphne* to die back each year, but it was repeatedly observed both at First Sister Lake and at Mud Lake that long bent over stems (sometimes 2 meters in length) which remained below the snow line were profusely flowered, while short stems (sometimes as short as 15 cm.) on hummocks in the center of clumps, which projected the greater part of their length above the snow, were uniformly killed back.

Killing was probably due to too thorough drying out of the exposed parts and not to freezing. It may be doubtful whether actual freezing had taken place as the leaves and twigs, while attached to the bushes, remained pliable in the lowest temperatures tested (– 24° C.), whereas the same twigs soon became brittle when severed from the plant.

TABLE SHOWING THE RELATION OF SNOW LEVEL TO WINTER KILLING IN *Chamaedaphne calyculata* (L.) MOENCH

(The first two examples are taken from data obtained at First Sister Lake and the others from Mud Lake bog. The first column under each example is the total number of flowers buds produced in 1911, while the second column is the per cent. which were killed during the winter of 1911–12. Numbers in italics are based upon parts of the plants above the snow level.)

Cm.	I		II		III		IV		V		VI		VII	
	Snow 56 cm.		Snow 65 cm.		Snow 85 cm.		Snow 85 cm.		Wind sweep snow 55 cm.		Snow 80 cm.		Snow 72 cm.	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No	%
90–100			*18*	*100*			*32*	*100*						
80– 90	*80*	*99*	*149*	*98*	34	0	*61*	*71*						
70– 80	*466*	*92*	*108*	*57*	97	0	96	0	*8*	*100*	182	0	*10*	*100*
60– 70	*317*	*80*	*100*	*50*	92	0	72	0	*122*	*98*	31	0	115	3
50– 60	161	27	115	17	—		9	0	*54*	*59*	—		124	0
40– 50	168	17	74	0	—		—		61	5	—		85	0
30– 40	212	2	130	3	—		—		—		—		55	0
20– 30	—		—		—		—		—		—		18	0
0– 20	—		—		—		—		—		—		—	

The natural distribution of *Chamaedaphne* is northern and throughout its range it is usually efficiently protected from the drying effect of severe prolonged cold by a covering of snow.

Recurring, severe, prolonged cold weather will kill it down to the snow level and the occurrence of such cold without an adequate snow protection must be at least one of the important limitations to the distribution of this plant in places which would otherwise be suitable for it.

UNIVERSITY OF MICHIGAN

SHORTER NOTES

SHADE-INDUCED UPRIGHTNESS IN THE SEASIDE SPURGE.—For some years my attention has been drawn to the behavior of *Euphorbia polygonifolia* L. as it grows in abundance upon the sand along the New Jersey coast. When growing in the open, the plants lie flat upon the sand and form attractive patches, the closely-forked stems varying in color from a pale green in some individuals to that of a bright red in others.

However when the plants chance to be among any shore grass the aspect is so changed that one might pass them by as of another species. Instead of the thick-set, stout, many-jointed plant it assumes an upright position and the internodes are several inches in length. Such plants do not thrive in even the partial shade of the slender-leaved grass and probably rarely set seed.

By subjecting very young plants, started in the full sun, to the shade of twigs stuck into the sand near them the writer has been able to note the taking on of the upright habit. When the plants have already become prostrate the artificial shade brought to them will induce a turning upward of the tips of the stems.

Many kinds of prostrate plants exhibit this tendency to become erect in the shade, but none seem to be more sensitive than the spurge in question.

BYRON D. HALSTED

ANCIENT AND MODERN VIEWS REGARDING THE RELATION OF TAXONOMY TO OTHER PHASES OF BOTANICAL WORK.—In the April number of TORREYA, Dr. P. A. Rydberg in his article on "Phytogeography and its Relation to Taxonomy and Other Branches of Science" says a few words in defense of taxonomic work, as follows: "Not long ago all botanical work done in this country was taxonomic work, usually known as systematic botany, although much had indeed little of 'systematic' in it. Now it is different. Courses in taxonomy are almost excluded from the curriculum of many of our colleges and universities or if not excluded so little esteemed that students are discouraged from entering upon them. *The taxonomist whether a systematic botanist in the true sense or a phytographer, is looked upon by phytogeographers, ecologists, physiologists, cytologists, and morphologists as of a lower grade of stuff;—as if it took a less fine grain of brain to make a first class systematist than any other kind of -ist.*"

It might be of interest to taxonomists as well as to those who are inclined to look upon physiology or morphology as representing the modern idea of what botany is or ought to be, while those whom they choose to call "mere taxonomists" are relegated to the same category as "stamp collectors," to compare recent views as expressed by Dr. Rydberg with those of one of the leading English mycologists who worked more than half a century ago.

In a paper read before the Quekett Microscopical Club on February 23, 1877, Dr. M. C. Cooke gave expression to his views in the following words: "In all branches of Natural History there are workers of two kinds: those who investigate the structure, physiology, origin, and development of a few forms, and endeavour to comprehend the whole mystery of their existence, and relationship to other manifestations of vital force, and those who devote themselves almost entirely to the study of various forms in any one or more groups, their relationship to each other, and their systematic and orderly arrangement, their affinities and their differences and their geographical distribution. *It is not uncommon to find those of the first group, the biologists, or physiologists, claiming a higher position for themselves than they accord to students of the other class, and even sneering at them as mere species-makers, or compilers of catalogues.* This is not only unjust but untrue; both are equally useful and equally essential and should not be made the subject of comparison. The work of the former is a great help to the latter whilst without classification there could be no science."

From the above quotations it will be seen that the ideas of those who are inclined to draw unjust comparisons between "mere taxonomy" and other phases of botanical work are not modern; neither are they restricted to this country but were current in England fifty years ago.

F. J. SEAVER

REVIEWS

Pammel's Manual of Poisonous Plants*

A Manual of Poisonous Plants is the title of a book recently pubished by L. H. Pammel, in which the author brings together into one volume most of the literature pertaining to plants injurious to man and to live stock.

The astonishing size of the book is explained on the first page of the foreword, thus: "I have placed the broadest interpretation on the subject and have, therefore, included all plants that are injurious, although many of these are not known to produce poisons, some even being most useful economic plants, and yet injurious to some people." Later on Pammel also says: "During the last decade, there has been much interest manifested in regard to plants injurious to live stock." I quote this as showing not only the trend of the author's thought, but to account, in part, for the great size of the volume.

The first chapter is headed "Poisons and Statistics on Poisons" and contains such sub-headings as "Ancient Use of Poisons," "The Rise of Chemistry and Poisons," "Ratzenburg on Poisonous Plants," "Statistics on Poisoning," "Statutes on Poisoning" and "Actions of Poisons on Different Animals." Under "Statistics of Poisoning" is given the number of persons dying by taking active poisons and by inhaling illuminating gas, and the poisonous cases reported among live stock in Montana during 1900. There are only seven pages in this chapter and the different subjects are treated so briefly that the information is necessarily very meagre.

* Pammel, L. H. Manual of Poisonous Plants. Pp. 1–977. f. 1–458 + many unnumbered figures and plates. The Torch Press, Cedar Rapids, Iowa. 1911. $7.00.

In the second chapter, under "Bacterial Poisons" impure water is considered as a source of disease, citing cases of poisoning among cattle resulting from drinking polluted water. Other subjects considered are botulism,—poisoning resulting from the action of *Bacillus botulinus*, which occurs in spoiled ham and sausage. Ptomaine poisoning is briefly considered, followed by a discussion of madismus,—poisoning resulting from eating spoiled Indian corn.

Chapters III, IV, VI, VII, VIII and IX are, except in a few instances, a treatise on veterinary practice. In these chapters appear such headings as "Dermatocytosis," explaining the causes, symptoms and treatment of skin diseases in the lower animals, considering among others, the ring worm of the horse in great detail, "Forage Poisoning," "Equisetosis," "Locoism," "Lupinosis," "Delphinosis," "Aconitism" and "Veratrism." The symptoms of poisoning as they occur in the live stock, together with the methods of treatment, are usually given in minute detail, which information is, of course, very valuable to the veterinarian, in diagnosing and treating cases of poisoning.

Chapter V, "Poisoning from Fungi," is mostly a discussion of reported cases of poisoning. The author states that it has been reported that a given fungus is sometimes eaten with impunity, while at other times it proves fatal. The author doubts if the same species were eaten in both cases, and that it would be impossible for a fungus to be poisonous at one time and not at another. Professor Peck, I believe this year, demonstrated that a fungus may develop poisonous properties when grown in one locality and when grown in another section of the country be edible and harmless.

In Chapter X, under "Poisoning from Flowers," reference is made to *Prunus serotina*, *Stapelia*, *Smilax herbacea*, *Polyanthes tuberosa*. On page 64, the author states that "The flowers of *Magnolia grandiflora* are overpowering, according to some authorities." Odors undoubtedly affect people differently; an odor which is disagreeable to one person may be pleasing to another. Asafoetida, which is displeasing to most people, becomes very pleasing on repeated handling. Asafoetida is used among our southern negroes, not for its medicinal value, but for its odor and the belief that if carried about the person, it will ward off illness and bring good luck.

Under the sub-heading "Poisoning from Honey," it is stated that *Kalmia latifolia*, *Robinia pseud-acacia*, *Euphorbia marginata*, and species of rhododendron have been proved as sources of poisonous honey. The above facts should prove of value to bee keepers. The source of the honey of the market is not known except in a general way as clover, buckwheat, etc. A microscopic examination of honey will often reveal its source through the presence of characteristic pollen-grains.

The eleventh chapter is pure toxicology, giving a classification of poisons with symptoms and antidotes.

In Chapter XII, under "Distribution of Poisonous Substances in Plants," Dr. Pammel speaks of some of the conditions governing the formation (elaboration) of poisonous substances, *i. e.*, light, heat, seasons, climate and cultural conditions. The time (season) of collecting medicinal plants is of first importance. This time varies with different drugs. The reviewer usually groups the plant parts for purposes of collection as follows: tubercules, tubers, bulbs, rhizomes, and roots should be collected at the close of the growing season; barks in the fall, after the death of the foliage, or before the spring foliage is fully developed; flowers, just before expanding; leaves and herbs, just at the beginning of the flowering period and most of the fruits when immature, but full-grown, and the seeds when mature. Under "Culture" it is stated that cultivation often entirely eliminates the poisonous constituent. *Lyanthus*, *Phaseolus lunatus* and *Aconitium napellus* are cited as becoming less toxic under cultivation. This latter statement would seem to be disproved by the fact that the British Pharmacopoeia requires British pharmacists to use only cultivated aconite grown in England. Also much of the golden-seal of the market is collected from cultivated plants. Analyses show the alkaloid in cultivated golden-seal to be present in even greater amounts than in the wild variety. This shows that no definite law can be given. One of the most important factors in increasing the percentage of active constituents in plants and a fact which is not mentioned, is in annually selecting for seed purposes, plants yielding the highest percentage of active constituents.

The thirteenth chapter deals with the algae in fresh-water supplies, specially with the working of the lakes and water bloom caused by various species of algae, chief among which are *Beggiatoa*, *Anabena*, *Lymbya* and *Clathrocystis*. The first remedy suggested for preventing these growths in reservoirs is to cover the reservoir. This, of course, is impracticable and would result in more harm than good if it were possible of application. The use of copper sulphate as an algicide is then considered.

Chapter XIV catalogues the more important poisonous plants of the United States and Canada. The material in this chapter is elaborated on and forms the basis of the second part. This part, consisting of 827 pages, includes all groups of plants from the bacteria to the flowering plants. In the beginning there is a key to the plant kingdom which is purely descriptive. This description is elaborated under each order. The plants considered poisonous are placed after the family; their description and habitat is given, and detailed descriptions of symptoms of poisoned animals and treatment as in Part I are frequently included.

This part is very broad in scope and names plants which are in daily use as staple articles of food, as rye, oats, wheat, and corn. These are mentioned as poisonous for the reason that when they are attacked by fungi they are injurious. The attack of the fungi completely changes the nature of their constituents and their structure, as is well illustrated by ergot. Ergot is no longer rye, but the resting stage of *Claviceps purpurea*. Such well-known fruits as pears, apples and peaches are classed as poisonous, as the seeds contain hydrocyanic acid and benz-aldehyde. The seeds and kernels are not the portion of these fruits which are eaten, but you can eat a limited amount of these parts with impunity. Yeast is considered poisonous on account of the alcohol produced by the action of its enzymes on sugar in solution. The alcohol is poisonous, not the yeast plant. Raspberries and blackberries are classed as poisonous, as there are several reported accidents due to mechanical injuries. According to this logic, needles, knives and forks would be classed as poisonous in a list of poisonous metals. Then too, such common plants as dandelion, chickory and marsh marigold are cited, in spite of the fact that these plants form part of the diet of thousands of people. No one under normal conditions could be forced to eat sufficient burdock root, *hydrastis* or *berberis* to prove fatal. There are hundreds of plants listed in these pages which are practically harmless in their normal form, yet when altered, as when their active constituents are extracted, and when administered in concentrated form, may prove injurious, if not poisonous. These plants should not be classed as poisonous, however, merely because in their changed form they are harmful in excessive amounts. Most of these and similar plants should be, and usually are classed as medicinal. It is doubtless true that all the poisonous plants are medicinal, yet only a small percentage of the medicinal plants are poisonous, in the generally accepted sense of the term. A clear line should be drawn between the mechanical-toxic and the medicinal-non-toxic plants. I suppose there is scarcely a food plant which some time or other has not been reported injurious or harmful to some one. This, however, should not be the test as to whether a plant is poisonous or non-poisonous. This ground is untenable and has resulted in the inclusion of hundreds of plants in the present volumes which are universally conceded to be non-poisonous. It is the author's elastic use of the word poison which is to me the weak point of the book. The volume is concluded with a catalogue of the plants of the world, poisonous or injurious to man. This list, like the manual, contains hundreds of economic and relatively harmless plants.

The author has brought together in these two parts the results of experimentation and research carried on under the direction of the United States Department of Agriculture at various experiment stations, as well as portions of the work of such men as Nelson, Peters and Bessey. This in itself would make the volume valuable, but added to this is the knowledge and fertile experience of the author who has for many years been one of the chief exponents of this line of work.

Part Two is really a manual of economic, medicinal, and poisonous plants, the poisonous plants being treated from the toxicological and veterinary standpoints chiefly. While the book contains a fund of information valuable to the physician, botanist, and layman, its greatest usefulness will doubtless be to students of animal industry and in particular to the veterinary practitioner.

The great number of illustrations and half-tone plates add to the value of the book. The paper is good. The subject matter is nicely spaced and arranged, and printed in good readable type.

William Mansfield

College of Pharmacy,
Columbia University

Scharff's Distribution and Origin of Life in America*

This is an octavo book of 497 pages, including 32 of bibliography and 26 of index, both of which important features are comprehensive and well arranged for quick and easy reference. The illustrations, twenty-one in number, are maps, which are in part designed to indicate the theoretical land and water conditions in certain periods of Mesozoic and Neozoic time, and in part to show the known distribution, past and present, of certain specific and family types of animal life in America.

As a compendium of recognized facts in paleogeography and the distribution of the faunal elements discussed the work is useful and valuable; but in certain other respects it may better be designated merely as "interesting," especially in connection with some of the theories advanced by the author to account for some of the facts discussed, and the more or less *ex parte* manner in which authorities are cited and quoted in support of the author's views and contentions. In fact those who are not well acquainted with the literature of the subject might infer, from the text, that certain theories not generally accepted had a preponderating weight of authority in their favor.

In fairness to the author, however, it should be said that he is quite frank in disclaiming an unprejudiced attitude in relation

* Scharff, R. S. Distribution and Origin of Life in America. Pp. i–xvi + 1–497, f. 1–21. New York, The Macmillan Company, 1912. *Price $3.00.*

to certain matters which he wishes to prove, and hence cites and quotes from those who favor his views more extensively and freely than from those who are opposed. For example, he says, in connection with the glaciers of the Ice Age: "To attempt even to discuss all the various lines of evidence which have led to the almost general acceptance of the land-ice theory, as understood at the present day, would be impossible in a work of this nature. I only wish to bring forward some of the chief reasons which have prevailed upon me to reject this theory." Conservative geologists might also regard some of his theories as more or less superfluous or unnecessary as, for instance, when he proposes to account for the well recognized marine or brackish-water conditions in the Great Lakes region during Pleistocene time in the following words: "Supposing the waters of the Arctic Ocean had risen, perhaps in consequence of the closing of the Atlantic Ocean, and had poured into Hudson Bay, overflowing its banks, and had then crossed the low-lying watershed separating this region from the depressions of the Great Lakes, the latter would soon have filled with brackish water. . . . I presume, of course, that troughs, not necessarily like the lakes now existing, already occupied the same region in pre-Glacial times." And then the generally accepted theory, based upon observed facts, is dismissed in the following summary manner: "Such an hypothesis of this area having been invaded by the sea in Pleistocene times is supported by some biological evidence, though it is usually argued that the ocean crept inland through the St. Lawrence and Hudson River Valley."

The geological discussions in general, especially such as relate to assumed former physiographic conditions and continental land connections, are reasonably complete, even including an argument for the former existence of a second "Atlantis," in the form of a land bridge in the Tertiary period, in order to account for certain phenomena of modern faunal distribution in the West Indian and Mediterranean regions.

Several excellent lines of argument are narrowly missed by the author in connection with his remarks on climatic conditions and unglaciated areas during the Glacial epoch, but his arguments are often either poorly expressed or are inconclusive as, for example: "No special reason can be deduced, therefore, why the present flora of Greenland should not have survived the Ice Age in that country, particularly as we have some grounds for the belief that the land in parts of the Arctic Regions then stood higher than it does now, and that consequently more land was available for plant life."

By careful reading of the entire work the botanist will find a few pages and some stray paragraphs here and there relating to the floras of Greenland, Alaska, the pine-barrens of the eastern United States, Florida, Bermuda, the Galapagos Islands, Central America, and South America; but the entire presentation and discussion of the facts relating to the botany and paleobotany of the latter continent occupies only four pages, and the other regions mentioned receive even less attention, relatively as well as actually, so far as the importance of their floral elements are concerned. If it is conceded that the title of a book should be truly indicative of its contents, this one should be changed to "Distribution and Origin of the American Fauna with Incidental References to the Flora."

ARTHUR HOLLICK

NEWS ITEMS

During the past summer Mr. W. W. Eggleston spent May and June collecting between Greycliff and Livingston, Montana, July and early August in Sevier Forest, southern Utah, and the remainder of the summer about the head of Lake Peud d'Oreillo, Idaho. Mr. Eggleston returned to Washington the latter part of September.

On October 14 Dr. Oliver A. Farwell delivered a lecture before the Scientific Institute of Detroit on the "Application of Botany to Pharmacy."

Mr. F. W. Pennell, of the University of Pennsylvania, has been traveling through the southeastern states this autumn collecting *Gerardia* and related genera.

Prof. Hugo de Vries spent two days at Tuscaloosa, Alabama, on his way to the type station of *Oenothera grandiflora*. At Mobile, Prof. de Vries met Prof. Tracy and they went 100 miles up the Alabama River to the station of the evening primrose. Mr. H. H. Bartlett accompanied Prof. de Vries while the trip led through Alabama. Early in October Prof. de Vries left with Prof. Tracy for Mississippi, Louisiana and Texas.

Dr. R. C. Benedict has been appointed an assistant teacher in the department of biology at the High School of Commerce, City of New York. The appointment took effect October first.

To the list of institutions, quoted on page 173 of TORREYA, as possessing the Flora brasiliensis should be added the Peabody Library and the library of Captain John Donnell Smith, both at Baltimore. The latter was given to the Smithsonian Institution some time ago, but has not yet been moved.

Professor Thomas H. Macbride, head of the department of botany in the State University of Iowa, is on leave of absence for the present year. He has been spending some time at Olga, Washington, on Orcas Island, one of the San Juan group. He and his family will live in Seattle until March or April.

Dr. Hally M. D. Jolivette, formerly instructor in botany in Leland Stanford University, has been appointed instructor in botany in the State College of Washington.

Professor R. Kent Beattie, formerly head of the department of botany in the State College of Washington, has resigned to accept a position in the Division of Plant Pathology, Bureau of Plant Industry.

Dr. W. J. G. Land, of the University of Chicago, sailed from San Francisco on Aug. 27, for Samoa, where he will collect liverworts and mosses. He will also visit the Sandwich Islands, Fiji Islands, New Zealand and Australia.

Mr. W. F. Wight, of the United States Department of Agriculture, who has recently spent four months studying plants in European herbaria sailed from London on August 16, for Argentine Republic where he will spend six months organizing a Division of Seed and Plant Introduction under the Argentine

Office of Experiment Stations. Mr. Henry F. Schultz, formerly of the United States Office of Seed and Plant Introduction, will have charge of sub-tropical introductions. Mr. James H. Cameron, formerly of the National Botanical Garden, will have charge of the propagating garden.

Dr. W. D. Hoyt has retired from his position at Rutgers College and will take up work at the Johns Hopkins University. He will spend the year principally in working on his report on the marine algae of Beaufort, N. C., for the United States Bureau of Fisheries.

Professor J. C. Arthur and Dr. Frank D. Kern spent a month during the past summer in field work in Colorado in continuation of their investigations of the Uredinales. The time was chiefly spent in the southern and southwestern portions of the state in localities not visited by them on previous trips.

Dr. J. N. Rose and Wm. R. Fitch spent about three weeks of September in southwestern Kansas studying especially the Cactaceae of that region. They also collected about 160 numbers of plants in that general locality.

Mr. Charles W. Finley, who for three years has been assistant in natural science in the School of Education, University of Chicago, has been appointed head of the department of biology of the State Normal School at Macomb, Illinois.

Dr. George B. Rigg, instructor in botany in the University of Washington, is engaged in work on the kelps of the Puget Sound region under an appointment from the United States Bureau of Soils. The investigation concerns the economic utilization of these kelps with special reference to their use as a source of potash fertilizer.

Dr. Roland M. Harper, of the Alabama Geological Survey, who spent the summer at the Biological Station of the University of Michigan at Douglass Lake, returned home through Illinois, visiting friends at the University of Chicago and the University of Illinois.

On the anniversary of Founders Day at McGill University, October 8, the university lecture was delivered by Francis E.

Lloyd, recently appointed MacDonald Professor of Botany. His subject was "The Artificial Ripening of Bitter Fruits."

The teaching staff of the Department of Botany at Syracuse University has been increased by the addition of Instructor Henry F. A. Meier, B.A. (Indiana University). Mr. Meier has had extended experience in teaching botany in the high schools of Indiana and was Sec.-Treas. of the Indiana Science Teachers' Association. The elementary course in Botany at Syracuse this fall has 225 students, the second year, 60 students.

Mr. A. J. Pieters, who has spent the past year studying the biology of water plants at Heidelberg, has been appointed instructor in botany at the University of Michigan.

Mr. F. C. Gates is in Manila at the University of the Philippines at Los Baños. He is teaching and doing research work for the United States Department of Agriculture.

Dr. Harry B. Humphrey, for three years professor of plant pathology in the State College of Washington, has been advanced to the position of head of the Department of Botany.

We learn from the *Evening Post* (26 October) that the corporation of Yale University has appointed Hugo de Vries as one of the Woodward lecturers for 1912–13.

An important acquisition to the collections of the Brooklyn Botanic Garden has just been negotiated whereby it will receive living specimens of more than 400 species of woody plants of the E. H. Wilson collections from China. These were secured during four expeditions to the republic and comprise the most important collections of living plants ever brought from that country. The Arnold Arboretum by whom the expeditions were conducted retains the most complete set. Other collections of a more general nature have also been received from the Arboretum and from the Park Commission at Rochester, N. Y., where the public park system is perhaps the richest, botanically, in America.

On the afternoon of Wednesday, October 31, in the presence of Park Commissioner Stover, Dr. N. L. Britton and a large gathering of spectators, the "oldest and biggest tree in Manhattan" was dedicated. The specimen is a giant tulip tree situated on the estate of the late Ernest Thalman, at Inwood, the extreme northerly end of Manhattan. Speeches were made by Commissioner Stover, Gen. James Grant Wilson, Dr. Stephen Smith, R. P. Bolton and Dr. Britton, who spoke in part as follows: "The tulip tree is the most characteristic tree of eastern North America. It grows naturally from Rhode Island, southern Vermont and Michigan on the north to Florida, Mississippi and Arkansas on the south, preferring rich, loose soil and the society of other trees. Its greatest size is attained in Tennessee and Kentucky, where it sometimes reaches nearly 200 feet in height, with a trunk diameter of nine or ten feet. The noble individual whose preservation we meet to-day to celebrate is probably the largest trunk in diameter known in this part of the country. Its circumference of nineteen feet indicates a diameter of a little more than six feet. There are, however, not a few specimens in upper Manhattan and the Bronx with trunks approximating five feet in diameter. The roots of these great trees are very long and numerous, extending in the soil far from the base.

"The tulip tree leaves are very different from those of any other plant; its large greenish yellow flowers open in May or June, and a fancied resemblance to those of tulips has given the tree its name; its fruit is a sharp pointed cone in which the seeds are to be found. The wood, known in commerce as whitewood, is valuable, being used for building, shingles and woodenware. The trunk of the tulip tree is usually a single column—specimens with two columns, caused by the tree's forking when young, as in the splendid plant we are now studying, being exceptional. Its circumference of 19 feet indicates a diameter of about 6¼ feet, or a radius of about 37 inches. The average number of annual layers of wood to the inch in the radius of the tulip tree up to 105 years old, when the radius is 22 inches, is 4.8, as shown by a trunk recently cut at the New York Botanical Garden. If the same proportion were carried out to the radius of 37 inches of the Inwood tree it would be 174 years old. As trees become older, however, the layers of wood formed annually are thinner, so that we may assume that in this specimen the average number of layers to the inch of radius may be about 6, which would indicate an approximate age of 222 years."

The following words are to be engraved on a tablet placed near the tree, which has been protected by a high iron fence: "Tulip Tree. *Liriodendron tulipifera.* Circumference, 19 feet. Age, 225 years. Henry Hudson entered this inlet in 1609 and may have met the Indians here who used the place for a camp, as shown by the quantity of old broken oyster shells around this tree and near by."

The many friends of Dr. G. A. Shull will be pleased to hear that he is recovering satisfactorily from an operation for appendicitis at the Skene Infirmary, Brooklyn.

Mr. Christy Michel, recently graduate student at Harvard and Ohio State University, has been appointed Professor of Botany at South Dakota College of Agriculture and Mechanic Arts.

On October 11, Prof. R. B. Thaxter, of Harvard University, known for his work on the Laboulbeniaceae, visited the Brooklyn Botanic Garden. Dr. Thaxter sailed in the afternoon for Trinidad where he will continue his work on these plants.

At the school of botany, University of Texas, Dr. I. M. Lewis has been promoted from instructor to adjunct professor and Dr. F. McAllister has been appointed an instructor in botany.

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EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

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THE HEMPSTEAD PLAINS OF LONG ISLAND*

By Roland M. Harper

There is in the western third of Long Island, within an hour's journey by rail from New York, about fifty square miles of dry land which was treeless when the country was first settled, and a considerable part of this can still be seen in its natural condition. This prairie, known locally as the "Hempstead Plains," is mentioned in a few historical and descriptive works, but long before geography became a science it had ceased to excite the wonder of the inhabitants, few of whom at the present time realize that there is not another place exactly like it in the world.

My attention was first called to it by the following statement in the U. S. Department of Agriculture's Soil Survey of the "Long Island area," by J. A. Bonsteel and others:†—"The . . . Hempstead plain is notable in being a natural prairie east of the Allegheny Mountains. In its natural state it bears a rank growth of sedge grass. It was treeless when first discovered and was originally used as commons for the pasturage of cattle and horses belonging to individuals and to communities." The

* This paper was originally read before the Association of American Geographers, December 31, 1909, and published in abridged form in the Brooklyn Standard-Union for January 16, 1910, and in full, with five illustrations, in the Bulletin of the American Geographical Society (**43**: 351–360) for May, 1911. On account of its local botanical interest, and in view of the fact that the periodicals named reach very few of the readers of Torreya, and that the area is rapidly being developed by real estate companies, we have obtained permission from the American Geographical Society to use it in Torreya. The author has here eliminated some passages which do not immediately concern botanists, and supplied an entirely new set of illustrations, none of which have ever been published before.—Ed.

† Field Operations of the Bureau of Soils for 1903, p. 99; or p. 13 of the "advance sheets" for this particular area, published in January, 1905. A somewhat similar statement occurs 27 pages farther on.

[No. 11, Vol. 12, of Torreya, comprising pp. 257–276, was issued 10 Nov. 1912.]

same thing has been mentioned incidentally in the catalogues of Isaac Hicks & Son, nurserymen of Westbury, L. I., and in "Long Island Illustrated," an attractive booklet issued annually by the Long Island Railroad.

For a generation or more the Hempstead Plains have been known to a few botanists as a good collecting ground, and every one who has traveled by rail from New York to Cold Spring Harbor, since the establishment of the Brooklyn Institute's biological laboratories at the latter place, has passed through several miles of what was once prairie, and seen a little which is

FIG. 1. Prairie scene about 3 miles south of Hicksville, *Quercus prinoides* in foreground, *Quercus minor* at left, *Betula populifolia* near center. August 25, 1909.

still in its natural condition; but to this day the real nature of the area in question has apparently never been mentioned in botanical literature. Previous to the summer of 1907 I had been along the edges of the area, as defined by Bonsteel, in several places, and penetrated into it for short distances, without seeing any natural vegetation, so I supposed that the prairie was all occupied by villages, private estates, farms, etc., and that it was consequently no longer possible to verify the published statements about its original vegetation. But one day in July of that year I happened to cross the center of the area on foot, and was surprised to find that there are still thousands of acres on which *the flora is practically all native.* This is pretty good evidence that such areas have not only never been artificially deforested, but also never been touched by the plow. Where the sod is once broken a very different flora, consisting largely of European weeds, comes in, so that areas which have ever been cultivated can be distinguished at a glance. The same is true to some extent of areas that have been too closely grazed.

The prairie occupies the central portion of Nassau County, about midway between the north and south shores of the island. Like the pine-barrens of Suffolk County, a few miles farther

FIG. 2. Looking westward across the dry valley of Hempstead Brook toward Garden City, *Myrica carolinensis* at edge of valley in right foreground. Sept. 29, 1909.

east,* it lies entirely south of the latest terminal moraine (the Harbor Hill moraine), but partly overlaps or dovetails into the older of the two Long Island moraines (the Ronkonkoma moraine). Originally it extended westward to where Floral Park now is, and eastward to Central Park, a distance of about twelve miles, and had its greatest breadth from north to south, about seven miles, very near its eastern end. North of the straight main line of railroad from Floral Park to Hicksville, and also

* See TORREYA 8: 2. 1908.

west of Garden City and Hempstead, the original prairie vegetation has been almost totally obliterated; but a little south of Hicksville there are still a few places where one could describe a circle a mile in diameter without including a tree or a house or a field. Probably about one fifth of the original prairie area is still in its natural condition, except for being intersected by roads.

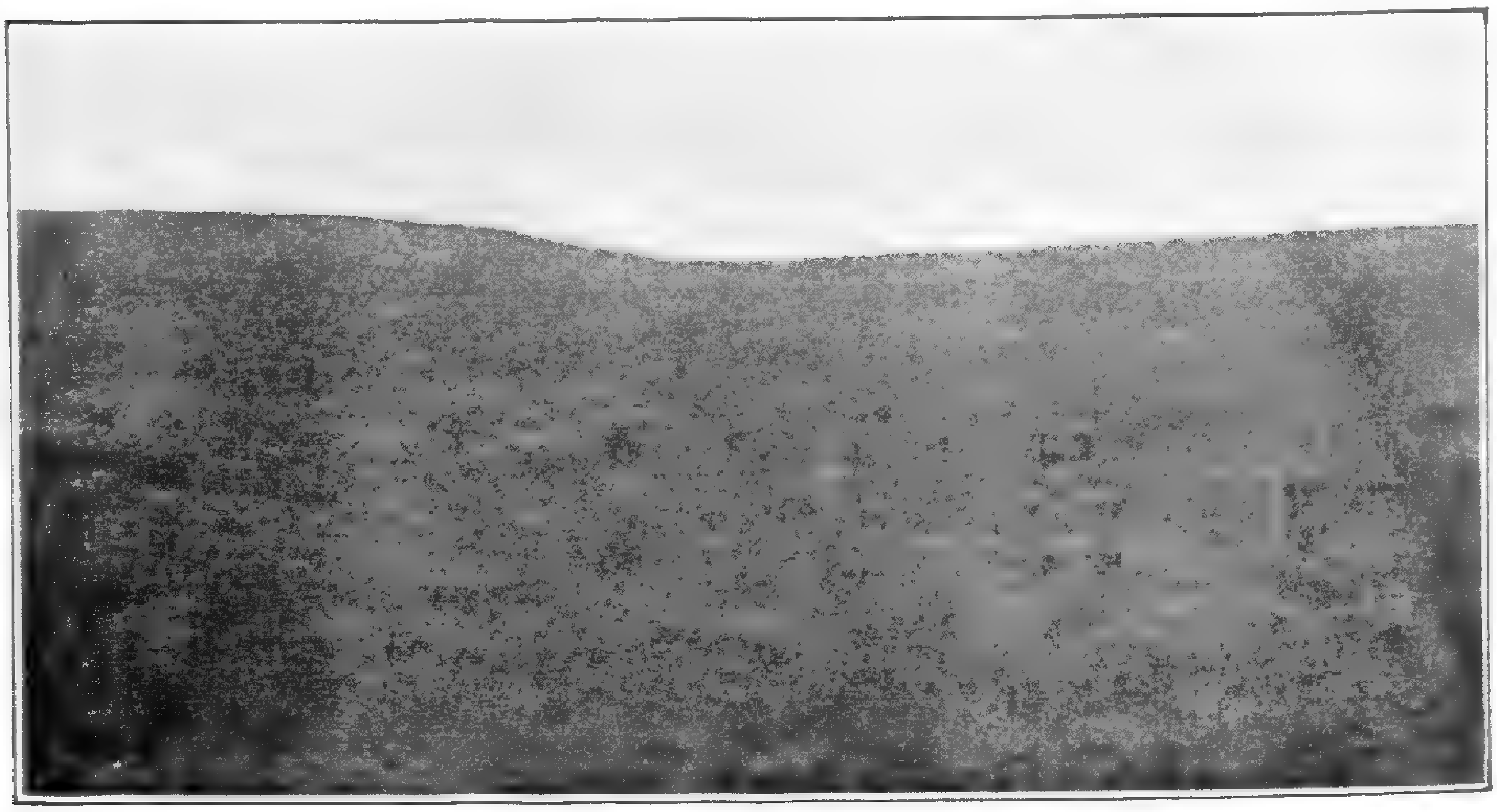

FIG. 3. Looking westward in dry valley about a mile south of Westbury Station. *Eupatorium hyssopifolium* in foreground. Aug. 14, 1909.

The surface of the Hempstead Plains, like the rest of the southern or unglaciated portion of Long Island, is for the most part very flat, and slopes gently southward at the rate of about one foot in 300. It ranges in altitude from about 60 to 200 feet above sea-level. Traversing the plain in a general north and south direction are a number of nearly straight broad shallow valleys, ten to twenty feet in depth, which are believed by geologists to have been formed by glacial streams and not by recent erosion. Within the limits of the prairie most of these valleys are now dry at all seasons, but farther south some of them contain permanent streams.

The upland vegetation of the Plains comprises about four species of trees, a dozen shrubs, sixty herbs, and a few mosses, lichens and fungi. The commonest tree is *Betula populifolia*, which in this region is oftener a shrub than a tree, and the other trees are *Quercus marylandica*, *Q. stellata*, and *Pinus rigida*, which are scattered sparsely over the eastern part of the area. The shrubs also are most abundant eastward. One of them is a willow, *Salix tristis*, and two are oaks, *Quercus ilicifolia* and *Q. prinoides;* and nearly all grow less than knee-high. The commonest herb is *Andropogon scoparius*, a grass which is said to be also common on some of the western prairies. The herbaceous vegetation, which is almost the only vegetation between Hicksville and Hempstead, with the exception of one ubiquitous shrub, *Pieris Mariana*, covers the ground pretty closely except in the most gravelly areas, is nearly all perennial, and averages about a foot in height.

Although the prairie vegetation grows in comparatively dry and sour soil, and gets about all the sunshine and wind there is in those parts, it exhibits no extreme xerophytic adaptions. A good many species, including several of the most abundant

Fig. 4. About a mile east of Garden City, looking eastward. *Salix tristis* in foreground. Sept. 29, 1909.

ones, have decidedly canescent foliage, and about half as many are glaucous, so that the whole landscape has rather a grayish tint. A large proportion of the species have very narrow leaves, but there are no succulents, and very few evergreens. On the other hand there are of course no very large or thin leaves.

Most of the trees and shrubs bloom in spring and most of the herbs in late summer. Most of the woody plants and about one sixth of the species of herbs are wind pollinated. Most of the colored flowers are either white, yellow or purplish, and none of them are very large or noticeably odoriferous. Wind is naturally the chief agent of dissemination, but the scarcity of

FIG. 5. Scene near northeastern corner of the plain, about half way between Hicksville and Syosset, looking approximately ESE. The trees are *Quercus marylandica.* Oct. 20, 1907.

berries and the complete absence of burs, in a region so accessible to birds and mammals, is a little surprising.

The dry prairies just described cover something like 99 per cent of the area. The principal stream in the Plains is East Meadow Brook, which begins gradually, at an indefinite point varying with the wetness of the season, in one of the valleys about three miles east of Mineola and Garden City, flows nearly due south, and enters the woods about a mile from its source. Next in importance is Hempstead Brook, which flows right through the town of Hempstead. It takes its rise in a narrow strip of meadow just above the town, and its dry valley can be traced for a few miles to the northward. Still farther west there are one or two smaller streams similarly situated and bordered originally by similar vegetation, but now considerably encroached upon by civilization. The wet meadow vegetation along these streams when viewed at a little distance does not differ much in aspect from that of the dry prairies, except that it is taller, many of the shrubs being as high as a man's head and the herbs knee-high. The species in the two habitats are of course almost entirely different, but their numbers happen to be about equal.

This prairie was originally bordered all around by forests, mostly of the oak type, but the border-line has been nearly everywhere obliterated by civilization. At some places south of Hicksville only a single row of fields at present intervenes between the prairie and the oak forest, but in most places the original boundary of the prairie could now hardly be determined within half a mile. Before the country was settled the oaks were presumably encroaching on the prairie from all sides. But in the few places where pine forests border the prairie I have never been able to determine which way the tension-line is tending to move.

The cause of the treelessness of prairies has probably been discussed in geological, semi-popular, and non-botanical literature more than any other strictly botanical problem, and perhaps even more than it has by botanists, but no explanation has yet been found to fit all cases. Some of the partial explanations which have been suggested for the well-known prairies of the upper Mississippi valley will apply as well to the one under consideration, and some will not.* In a paper of such limited scope as this it would be out of place to attempt to review all the prairie theories, or even to mention all who have speculated on the subject; and only the briefest summary can be given here.

Among the western prairie theories which will not apply on Long Island are deficient rainfall, extreme variations of temperature, and impervious subsoil. Our prairie is subject to a good deal of grazing, frequent fires, strong wind, and excessive evaporation, like the western ones, but these factors are the result rather than the cause of treelessness, so that they could hardly have

* The interesting papers of Shimek (Proc. Ia. Acad. Sci. **7**: 47–59. *pl. 4.* 1900; Iowa Geol. Survey **20**: 426–474. 1911; Bull. Lab. Nat. Hist. State Univ. Iowa **6**: 169–240. *pl. 1–14.* April, 1911) and Gleason (Bull. Torr. Bot. Club **36**: 265–271. 1909) should be examined in this connection.

determined the prairie in the beginning or fixed its present boundaries.

There are two suggestions that have been made with regard to the prairies of the Middle West which deserve more notice, though each leaves much to be explained. Alexander Winchell in 1864* summed up the opinions of most of his predecessors on the subject, indulged in some curious and perhaps not altogether essential observations on the vitality of buried seeds, and con-

FIG. 6. About two miles east of Hempstead, looking north. Harbor Hill in distance, about 6 miles away. Sept. 27, 1907.

cluded that the "prairies were treeless because the grasses first gained foothold and then maintained it." The same idea has recently been expressed more elaborately by L. H. Harvey.† Prof. J. D. Whitney in 1876‡ distinguished between the arid plains toward the Rocky Mountains and the relatively humid prairies near the Mississippi River, showed the inadequacy of climatic theories to account for the latter, and pointed out that

* Am. Jour. Sci. 88: 332–344, 444–445.

† Bot. Gaz. 46: 86, 297. 1908.

‡ Am. Nat. 10: 577–588, 656–667.

all such areas known to him were characterized by essentially horizontal strata, level surfaces, and finely divided soil. He distinguished between cause and effect, unlike some others who have written on the subject, but admitted his inability to show a causal relation between the conditions he described and the absence of trees. What he said about the topography and soil of the western prairies applies almost as well to those of Long Island* (which he probably knew nothing about), and even to some other kinds of treeless areas, such as wet meadows and salt marshes.

Although the prairies of Long Island are closely correlated with a certain type of soil, it is still an open question whether most of

FIG. 7. Looking up East Meadow Brook from the Farmingdale Road, running east from Hempstead. Aug. 25, 1909.

the peculiarities of prairie soil, here and elsewhere, may not be due to long occupation of the same ground by herbaceous vegetation. In its mechanical analysis, and even in its color, the "Hempstead loam" strikingly resembles the "Galveston clay" (an arbitrary name for a well-known type of soil, the salt marsh) described in the same government soil report; but it is probably

* Mechanical analyses of the "Hempstead loam" by the U. S. Soil Survey show that about 76 per cent of it consists of particles less than 1/20 of a millimeter in diameter, and that less than 3 per cent of it is in particles exceeding a millimeter.

a little too early to jump to the conclusion that the area in question was once a salt marsh while adjoining areas were not.

Not the least interesting fact about this unique insular coastal plain prairie is that so much of it is still in a state of nature, although it is situated in a county which has been settled for 250 years and has about 300 inhabitants to the square mile, and is all within the zone in which it is profitable to haul farm products to New York by wagon. This state of affairs is probably due to a combination of several more or less independent causes. Good crops are raised on the parts that are under cultivation, but the toughness of the sod, the thinness of the soil, and especially the scarcity of water, doubtless operate strongly to keep away new settlers unused to such conditions. That tradition has had a good deal to do with the preservation of the prairie is suggested by the following passage in the second edition of Thompson's History of Long Island (Vol. I, p. 29, 1843), which would be almost equally true today: "If the whole of this open waste was disposed of and inclosed in separate fields, the agricultural products of this portion of the island would be nearly doubled. A stupid policy, consequent upon old prejudices, has hitherto prevented any other disposition of it, than as a common pasturage. It is hoped the time is not far distant, when this extensive tract shall abound in waving fields of grain, yielding not only support, but profit, to thousands of hardy and industrious citizens."

Even if no more of this land were taken up in farms, the continued growth of New York City is bound to cover it all with houses sooner or later, and it behooves scientists to make an exhaustive study of the region before the opportunity is gone forever.

No one yet seems to have attempted seriously to enumerate, classify and explain the numerous and various treeless areas of eastern North America. If this were done perhaps other areas similar in character to the one described might be found. There are abundant hints of small prairies, open glades, natural meadows, etc., in early descriptive works dealing with parts of the country that are now pretty thickly settled, and many examples of them have doubtless already been effectually obliterated, and irrevocably lost to science.

NOTES ON THE FLORA OF NORTHAMPTON COUNTY, PENNSYLVANIA

By Eugene A. Rau

Having for a number of years studied the flora in the vicinity of Bethlehem and having made quite a large sized herbarium it was an agreeable surprise for me to notice Mr. King's Flora of Northampton Co., Pa., recently published in Torreya. In examining the list, however, I detected the omission of a number of plants which I had found at various times, and by reference to my herbarium desire to record the addition of the following together with the addition of a number of habitats.

Apparently much work still remains to be done in recording the flora in all parts of the county and designating the ranges of the various species. A thorough search will doubtless necessitate many additions to the list and thus relieve it of the too local character which it now bears.

Additions to Plants

Lycopodium lucidulum Michx. Hillsides along Monocacy, 1872.

Lycopodium complanatum L. Hillsides, Freemansburg, 1872.

Lycopodium obscurum L. On Lehigh Mt.

Equisetum fluviatile L. In shallow water, Lime Ridge, 1872.

Phegopteris hexagonoptera (Michx.) Fee. In woods, Lehigh Mt., 1871.

Asplenium platyneuron (L.) Oakes. In woods, Lehigh Mt., hillsides near Freemansburg, 1872; along the Bushkill creek, Easton, 1872.

Cystopteris bulbifera (L.) Bernh. On rocks near Illick's mill, 1898; along railroad cut near Bethlehem steel works, 1879.

Batrachium trichophyllum Chaix. Along the Saucon and Monocacy creeks.

Ranunculus obtusiusculus Raf. On small island in Lehigh River near Bethlehem.

Actaea alba (L.) Mill. In woods, Lehigh Mt., 1871.

Stylophorum diphyllum Nutt. In cultivated grounds, Bethlehem.

Phlox paniculata L. Low grounds near Hellertown, 1878.

Phlox pilosa L. Hexenkopf Hills, 1871; also along the Monocacy, 1869.

ADDITIONS TO RANGES

Selaginella apus (L.) Spring. Along the Monocacy, also near Seidersville, 1871.

Pellaea atropurpurea (L.) Link. On boulders near Illick's mill along the Monocacy, 1871; Jones' ledge along the Lehigh, 1876.

Matteuccia Struthiopteris (L.) Hoffman. On Chain Dam Island along the Lehigh near Easton, 1880.

Camptosorus rhizophyllus (L.) Link. On the rocks, Lehigh Mt., 1879; near Freemansburg, 1879; Lime ridge along the Lehigh, 1872.

Juniperus virginiana L. Hillside, Nisky Cemetery, Bethlehem.

Potamogeton perfoliatus L. Lehigh river, 1871.

Potamogeton crispus L. Saucon creek, 1872.

Vallisneria spiralis L. Lehigh river, Bethlehem.

Arisaema Dracontium (L.) Schlott. Along the Monocacy.

Ornithogalum umbellatum L. Seminary grounds near the Monocacy.

Cypripedium hirsutum Mill. Near Illick's Mill, Monocacy creek.

Hicoria glabra (Mill.) Britton. Nisky, Bethlehem, reported by C. N. Lochman.

Corylus rostrata Ait. Lehigh Mt., 1869, and along the Monocacy, 1871.

Corylus americana Walt. Fence corners along the Monocacy, C. N. Lochman.

Fagus americana Sweet. Along the Monocacy.

Quercus macrocarpa Michx. Formerly found near Nazareth from which place several trees were transplanted to Nisky Cemetery, Bethlehem.

Urtica gracilis Ait. Along the Lehigh, 1871.

Celtis occidentalis L. Cultivated and waste grounds, Bethlehem, 1871.

Sagina procumbens L. In streets, Bethlehem, 1891, 1912.

Caltha palustris L. Is rather common in low grounds along streams while *Trollius laxus* Salisb. is rare and local in the southern part of the county.

Atragene americana Sims. Hexenkopf hills, Williams Twp., 1871.

Bicuculla Cucullaria (L.) Millsp. Lime Ridge, 1868.

Draba verna (L.). Cultivated grounds, Bethlehem; also near Freemansburg, 1870.

Hamamelis virginiana L. Along the Monocacy.

Gleditsia triacanthos (L.). Cultivated grounds and Sand Island, Bethlehem.

Vicia americana Michx. Lime Ridge, 1870; near Freemansburg, 1872.

Polygala Senega (L.). Near Leithsville, 1880.

Viola pedata (L.). Lehigh Mt. and Lime Ridge, 1871.

Epigaea repens (L.). Hills near Freemansburg, 1866; also Lower Saucon Twp., 1899.

Gentiana crinita Froel. Near Illick's Mill, Monocacy, 1871 to 1879; swampy ground near Easton, E. A. Rau, in meadows near Hellertown; reported by C. N. Lochman.

Convolvulus arvensis L. College Hill, Easton, 1872, E. A. Rau; waste places, Bethlehem, C. N. Lochman, 1912.

Trichostema dichotomum L. Roadsides, Seidersville, 1877.

Solanum nigrum L. Sand Island, 1871, along the canal, 1874.

Dasystoma Pedicularia (L.) Benth. In woods along Monocacy, 1870.

Gerardia tenuifolia Vahl. In woods along the Monocacy, 1875.

Melampyrum lineare Lam. In woods, Lehigh Mt.

Leptamnium virginianum (L.) Raf. In beech woods, Monocacy, 1873–1879.

Galium circaezans Michx. Hexenkopf Hills, 1871; Nisky Hill and along the Monocacy, 1871.

Galium asprellum Michx. Nisky Hill, 1871.

Galium Aparine L. Nisky Hill, 1871.

Hieracium pilosella L. Cultivated grounds, Bethlehem.

A TRICARPELLARY WALNUT*

By William H. Lamb

A tricarpellary walnut is one that is separable into three divisions. In general walnuts are bicarpellary, but tricarpellary forms do occur, especially in our so-called "English walnut," *Juglans regia* L. The accompanying sketch shows an end view and diagrammatic cross section of one of these interesting forms.

The term "English walnut," by the way, is a misnomer, for *Juglans regia* is not a native of England at all. It is extensively cultivated in England and on the continent, but is native to southeastern Europe, Greece, Asia Minor, and China. It has been more properly called "Persian walnut."

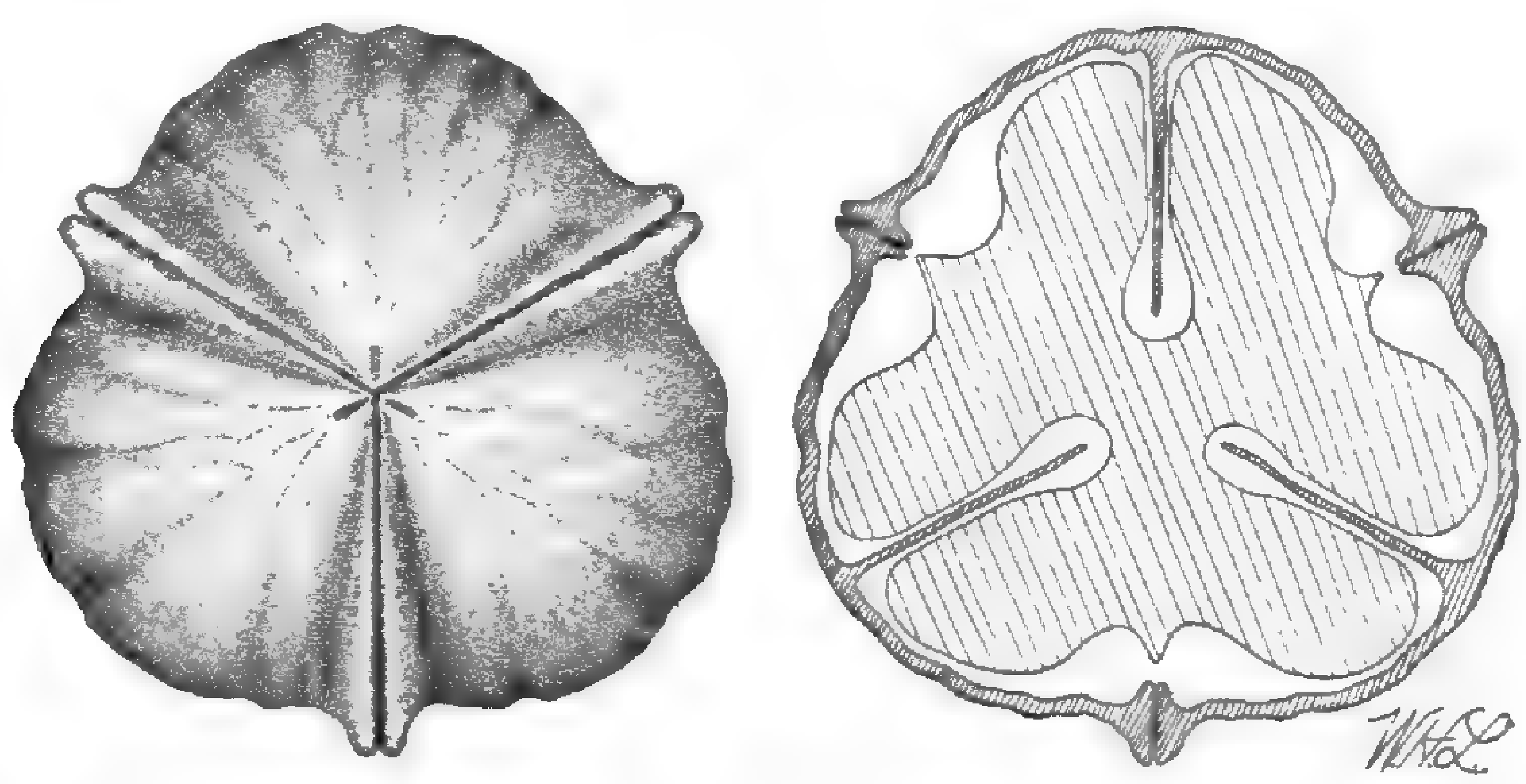

Fig. 1. End view, natural size, and diagrammatic cross section of a tricarpellary walnut (*Juglans regia* L.).

Before discussing the significance of a tricarpellary walnut, it might be well to consider just what a walnut is. A walnut is not a fruit. Indeed it is an interesting fact that no species of *Juglans* bears edible fruit. The fruit proper is a bitter, green or black, more or less fleshy drupe. It contains the walnut, just as a peach contains a large seed. If we were to throw away the fleshy part of the peach and retain the stone as a delicacy, we would be doing precisely what is done in the case of the walnut. The edible portions of a walnut are the large cotyledons.

These cotyledons are deeply lobed in consequence of an in-

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complete septation of the cavity of the ovary. That is, the seed is divided internally by a false partition which does not completely separate the cavity into two parts, and the cotyledons are lobed and wrinkled to fit into the irregularities of the inner surface of the seed. The English walnut, then, though morphologically bicarpellary, contains but one ovule; *i. e.*, it is morphologically a true nut (one-seeded pericarp resulting from a several carpelled gynoecium).

Now what we would expect to find in a case of reversion would be a form in which this division of the ovary was complete, forming by this septation a true bicarpellary ovary, but in this specimen we find a reversion to a type in which there are three incomplete septa in the ovary, forming a nut which is separable into three parts, but which contains but one ovule, with three cotyledons. This is probably due to the fact that the reduction of the ovary in the *Juglandaceae* has been carried so far that the ovule has become basal and erect, and a complete septation of the ovary is prevented by the obstruction of the hypocotyl or upright stalk which supports the cotyledons.

PROCEEDINGS OF THE CLUB

October 8, 1912

The meeting of October 8, 1912, was held at the American Museum of Natural History. Dr. E. B. Southwick called the meeting to order at 8:30 P.M. Eight persons were present.

The minutes of May 29 were approved.

Mr. Henry O. Severance, librarian of the University of Missouri, Columbia, Missouri, and Mr. Otto Kunkel, Columbia University, New York City, were nominated for membership.

Mr. Sereno Stetson, chairman of the field committee, and Dr. E. B. Southwick reported on the field meetings held during the summer.

The application of Miss Jean Broadhurst for a grant of two hundred dollars from the Esther Hermann Fund to assist her in carrying on her studies on the bacteria of the milk supply was approved.

The secretary read a communication from the Rice Institute of Texas inviting the president of the Torrey Club to be present at the dedicatory services of their new building.

The scientific program consisted of informal reports by various members on the collections made during the summer.

Professor R. A. Harper spoke of having collected a number of species of *Boleti* from the vicinity of Woods Hole, Massachusetts.

Mr. Stetson mentioned several expeditions which he had conducted at Copake Falls and among the hills of Connecticut.

Dr. Tracy Hazen gave a short account of his botanical investigations in Connecticut, and Dr. Southwick mentioned the work he had been doing along the line of establishing school gardens.

Dr. M. A. Howe reported progress on his work on the marine algae.

The secretary read a communication from David R. McCord, asking for information regarding the particular species of corn originally grown by the American Indians.

Meeting adjourned.

B. O. Dodge,
Secretary

NEWS ITEMS

Dr. E. D. Clark, one of the editorial board of the Torrey Club, has been appointed instructor in chemistry at the Cornell Medical College, where he will continue work on phyto-chemical problems.

The Royal Bavarian Academy of Science has awarded its medal of merit to Dr. C. C. Hosséus for his work on the flora of Siam.

A course of lectures on cryptogamic botany will be given this winter by Professor A. Vincent Osmun, of the Massachusetts Agricultural College, at the Museum of Natural History, Springfield, Mass. A similar course in general botany was conducted by Professor Osmun last winter. These lectures are free to the public.

A statement in *Science* early last summer to the effect that the *Flora brasiliensis* was to be found only at the University of Illinois, Harvard, Columbia and the Missouri Botanical Garden has been widely copied. Final returns indicate that this valuable work is also in the following libraries: Parke Davis & Co., at Detroit, Academy of Natural Sciences at Philadelphia, Ohio State University, Peabody Library and the library of Captain John Donnell Smith both at Baltimore, and at the Library of Congress.

The University of Florida and the Florida Agricultural Experiment Station were honored by a visit from Prof. Hugo de Vries in October. After spending a week at this institution he left for a visit to the Keys along the Over Sea Railroad between Miami and Key West. During his Florida exploration Professor de Vries was accompanied by Dr. J. K. Small, of the New York Botanical Garden and Dr. P. H. Rolfs.

Dr. H. S. Reed, of the Virginia Polytechnic Institute, will sail for Italy early in January. He will spend some time at the Zoölogical Station in Naples and carry on some work in one of the German universities during the summer semester.

Dr. A. M. Ferguson, of Sherman, Texas, has a collection of Texas plants, in quantity, for making up into fasicles. Any one interested in the naming, arranging and sale of such material should write to him.

Dr. N. L. Britton, accompanied by Mr. Stewardson Brown, of the Academy of Natural Sciences of Philadelphia, sailed for Bermuda on November 27 to continue their studies on the flora of that island. Dr. F. J. Seaver has gone with the party to study the fungi of the island. The expedition will sail for New York on December 16.

We learn from *Science* (November 15) that Professor M. L. Fernald, of the Gray Herbarium, delivered a lecture at Chicago, before the Geographical Society, on November 8 on "The

Mountains and Barrens of Newfoundland and the Gaspé Peninsula."

Dr. Herbert J. Webber, of Cornell University, has returned from an extensive trip in the West, where he has been delivering lectures. He spent some time at the University of California, where he was offered the post of director of the citrus experiment station and Dean of the Graduate School of Tropical Agriculture. He has not decided whether he will accept the position.

On Monday, November 25, Rutgers College heard a lecture on the Luther Laflin Kellogg Foundation by Professor Hugo de Vries, director of the Hortus Botanicus at Amsterdam, Holland. Professor de Vries discussed "A New Conception of the Evolution Theory." Professor de Vries while making a study of the botany of Florida visited Crescent City where extensive citrus groves in full bearing were examined. In the region around Satsuma he visited the 700-acre camphor orchard, this being of special interest to him from the fact that the trees are all seedlings from seed gathered in Florida.

From *Science* (November 22) we learn that Doctor Jacques Huber, director of the Goeldi Museum of Natural History and of the Botanical Garden of Pará, Brazil, has been visiting the scientific institutions of the United States.

Mr. Henry Groves, who with his brother, Mr. James Groves, is the author of important contributions to botany, died in London on November 2, aged fifty-seven years.

At Cleveland, December 30–January 4, the American Association for the Advancement of Science will hold its annual meeting. Dr. C. E. Bessey, the retiring President, will introduce the President of the present meeting, Dr. E. C. Pickering. The botanical section, G, will hear the vice-presidential address of Professor Newcombe on "The scope of state natural surveys." Botanical societies meeting at Cleveland during the same week include, The Botanical Society of America, Botanists of the Central States, American Phytopathological Association and the Association of Official Seed Analysts.

From the *Evening Post* (November 23) we learn that the post of research assistant on the staff of the Missouri Botanical Garden, made vacant by the resignation of Dr. R. R. Gates, has been filled by Dr. George R. Hill, who received his undergraduate degree from the Utah Agricultural College. Miss Margaret De Merritt, of New Hampshire College; A. R. Davis, of Pomona College; L. O. Overholz, of Miami University; J. S. Cooley, of Randolph-Macon College and Virginia Polytechnic and W. H. Emig, of Washington University, are the Rufus J. Lackland research fellows in the Henry Shaw School of Botany during the present year.

H. E. Stevens, pathologist to the Florida Experiment Station, has definitely established, according to Professor P. H. Rolfs, the fact that *Phomopsis Citri* Fawcett is the causative agent of melanose in *Citrus* trees.

Dr. Wilhelm Miller, for many years editor of *Country Life in America*, and co-editor with L. H. Bailey of the *Cyclopedia of American Horticulture*, has severed his connection with Doubleday, Page and Company to accept the position of Assistant Professor of Landscape Architecture at the University of Illinois.

Mr. W. G. Stover, recently at the Oklahoma Agricultural College, has been appointed instructor in botany at the Ohio State University, Columbus, Ohio.

Nevada S. Evans, graduate of the University of Minnesota and expert in the seed laboratory of Northrup, King & Co., has accepted the position of Assistant Botanist in the North Dakota Agricultural Experiment Station, and will report for work in the Pure Seed Laboratory of that institution December 1.

Professor E. S. Reynolds, of the University of Tennessee, Knoxville, has accepted the position of Associate Professor of Botany at the North Dakota Agricultural College. Mr. Reynolds took up his new work at the Agricultural College, November 1.

A hundred Kny charts have just been added to the botanical equipment of Baylor University, Waco, Texas.

We learn from the *Times* (December 5) that Dr. William Armstrong Buckhout, Professor of Botany and Horticulture at the Pennsylvania State College, and one of the oldest members of the faculty, died in Philadelphia on Tuesday, December 3, at the age of 61 years. He was a Fellow of the American Association for the Advancement of Science and of many other scientific societies. Dr. Buckhout had held a professorship since 1871.

A. Anstruther Lawson (Ph.D. Chicago, 1902), who has been a member of the botanical staff of Stanford University, and, more recently, of the University of Glasgow, has been appointed professor of botany in the University of Sydney, New South Wales.

INDEX TO VOLUME XII

New names and the names of new genera and species are printed in **boldface type.**

The Torrey Botanical Club

Contributors of accepted articles and reviews who wish six gratuitous copies of the number of TORREYA in which their papers appear, will kindly notify the editor when submitting manuscript.

Reprints should be ordered, when galley proof is returned to the editor. The New Era Printing Co., 41 North Queen Street, Lancaster, Pa., have furnished the following rates:

	2pp	4pp	8pp	12pp	16pp	20pp
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Covers: 25 for 75 cents, additional covers 1 cent each.

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The following Committees have been appointed for 1912

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W. A. MURRILL

Delegate to the Council of the New York Academy of Sciences
WILLIAM MANSFIELD

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 38 published in 1911, contained 570 pages of text and 35 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24–37 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24–27 are furnished at the published price of two dollars each; Vols. 28–37 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–13 are now completed; Nos. 1 and 2 of Vol. 14 have been issued. The subscription price is fixed at $3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) **The Preliminary Catalogue of Anthophyta and Pteridophyta** reported as growing within one hundred miles of New York, 1888. Price, $1.00.

Correspondence relating to the above publications should be addressed to

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New York City